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SUMMARY OF THE COLLECTIONS OF AMPHIBIANS MADE  
IN MÉXICO UNDER THE WALTER RATHBONE BACON  
TRAVELING SCHOLARSHIP

By EDWARD H. TAYLOR and HOBART M. SMITH

INTRODUCTION

By tenure of the Walter Rathbone Bacon Traveling Scholarship from 1938 to 1940, the junior author was enabled to continue field studies that had been under way several years on the herpetofauna of México. Aided by his wife, he accumulated a collection of reptiles and amphibians the study of which still continues. A brief summary of the snakes and crocodiles has appeared previously (Smith, 1943). With the aid of the senior author a summary of the amphibians has been completed and forms the basis of the present paper. The lizards are being studied as time permits, and a summary of them is contemplated. No survey of the turtles is envisioned. The itinerary and list of localities visited by the collectors will accompany a later report.

The amphibians comprise 10,370 specimens, or about half the total number of herpetological specimens obtained. They represent 27 genera and 146 forms. Thirty-three of the species were undescribed at the time of collecting; the specimens of them secured have formed the basis at least in part for their subsequent descriptions. Eleven of the 33 are represented only by paratypes, while 22 are represented by holotypes. Of the latter, eight are described in the present paper, while all others were described by Taylor (1940c, 1941b, d, e, 1942a-d, 1943a, b) or Smith (1939). Another 33 species, represented by neither holotypes nor paratypes, are exemplified by topo-

types. Eighty-four species are new to the Mexican collections of the United States National Museum, where all specimens collected during tenure of the Scholarship have been deposited.

Most of the specimens have been incorporated in the permanent collections of the United States National Museum, whose numbers are cited herein with the abbreviation U.S.N.M. A few duplicates have been transferred to the E. H. Taylor-H. M. Smith collection; the numbers for these are cited with the symbol E.H.T.-H.M.S. The other duplicates are not regularly listed for all species, but where reference to particular specimens has been necessary the field numbers for them are cited following the initials H.M.S.

Salamanders and anurans are nearly equally represented in number of specimens, the former including 5,096, the anurans 5,258 specimens. Of caecilians only six specimens are cataloged.

Although reptile species far exceed amphibian species in México numerically, the abundance of individuals and ease of collection of the latter—at least at particular times in certain places—account in part for the proportional preponderance of number of specimens of amphibians over reptiles in the collection. Furthermore, about three-fourths of the amphibian species known from México are represented, while of the snakes only about half the species were collected. Undoubtedly the abundance and ease of collection of amphibians have contributed greatly to the relatively large percentage of representation of the Mexican fauna in this collection, yet there definitely is a technique peculiar even to the collection of these creatures. Equally as important as other factors in our favor was the aid afforded by Dr. E. H. Taylor, who during a month's time escorted the junior author and wife on a flying and unbelievably productive visit to many localities previously discovered by him as ideal for the collection of various restricted species. Without this assistance, and without much other information gleaned from the same source—both in previous collecting trips and in written or oral instruction—surely much less would have been taken.

Chief among others contributing to our efforts are Mr. and Mrs. Dyfrig McH. Forbes, of Potrero Viejo, Veracruz, whose hospitality, charm, and zeal for collecting have left an indelible stamp upon the fruits of our years in México and upon our memories as well.

To Dr. Doris M. Cochran we owe a debt of gratitude for patient and prompt attendance to our numerous requests for a checking of data and specimen numbers, and for ready cooperation in many other respects as well. Finally, Dr. Alexander Wetmore has the deepest appreciation of us who have benefited directly or indirectly from his kindly and sympathetic supervision and encouragement during tenure of the Scholarship, both in the field and at the U. S. National Museum.

A preliminary examination of the amphibians was completed by Smith while at the U. S. National Museum in 1941 and 1942. More attractive studies and other duties assumed subsequently interfered with the undertaking of a careful study, however, for a considerable period. Then, since further delay would unduly hinder the completion of our projected summary of the amphibians of México, at the junior author's request Taylor undertook the final study of the amphibians. Most of the descriptive work of the completed summary is his, although of course each author has studied the specimens and agreed upon the proper treatment for them.

Our purpose in presenting this paper is to summarize briefly the Bacon collection alone. The treatment is complete except for *Ambystoma* sp. and a new genus of hylid frogs, description of which will appear elsewhere. Since a summary of wider scope is being compiled at present, we have included here but few extraneous notes; those included chiefly concern U. S. National Museum specimens.

The synonymies are so constructed as to give references at least to (1) the original description and (2) the first appearance of the combination we adopt. For many species the synonymy requires but one reference to satisfy these two demands. In certain cases we have included other references we believe quite important, particularly if they concern synonymic names. Citations of other references, where necessary, are given parenthetically in the species discussions. All papers referred to are listed in the "Literature Cited."

The photographs were taken by the University of Kansas photographer, Miss Burch Brown, and the drawings are the work of Robert Nabours, of the same institution.—H. M. SMITH.

## Order APODA Gray, 1825

### Family CAECILIIDAE Gray, 1825

#### Genus GYMNOPI S Peters, 1874

#### GYMNOPI S MULTIPLICATA OAXACAE Mertens

*Gymnopsis multiplicata oaxacae* MERTENS, Abh. Ber. Mus. Magdeburg, vol. 6, 1930, pp. 153-155, fig. 14 (Cafetal Concordia, 600 m., between Puerto Ángel and Salina Cruz, Oaxaca).

"Six specimens are in the collection: One from Xaltianguis, Guerrero (U.S.N.M. No. 115057), collected by E. H. Taylor, September 2, 1939; and the other five from La Esperanza, Chiapas, April 5, 1940 (U.S.N.M. Nos. 115058-115062).

The specimen from Guerrero was found under leaves in a shallow, open arroyo in a field. An adult female was found in a rotten log on April 5, 1940, at La Esperanza, Chiapas. It was drowned in alcohol, and when the abdomen was cut open, four live, wriggling, young

caecilians separated themselves from their enveloping membranes and crawled about in a dry pan. They probably would have been born the same or the next day.

The eye spot is visible in all specimens. Measurements are as follows:

U.S.N.M. No.	Primaries	Rings without secondaries	Complete secondaries	Total length (mm.)	Diameter (mm.)	1/d
115058.....	121	23	15	280	7	40
115059.....	120	16	48	99	4	24.75
115060.....	119	15	41	98	4	24.5
115061.....	122	24	21	98	4	24.5
115062.....	119	17	20	96	4	24
115057.....	135	13	10	151	4.5	33.6

The primary rings are less numerous in Chiapas specimens than in most from Oaxaca and Guerrero. Recorded counts from seven Chiapas caecilians show a range of variation from 119 to 122; in 12 Guerrero and Oaxaca individuals the range of variation is from 124 to 135, with the exception of one specimen, which has 121.

It is extraordinary that the number of complete secondaries should be so greatly increased over the normal complement of adults and subadults in the newly born young. The maximum known in adults is 16, while all the four young have over 19, and two have over 40. It appears that the number of complete secondaries decreases shortly after birth, and not impossibly over a longer period. If such is the case it might be expected that the number of incomplete secondaries should be increased in the young, over the normal number in adults, and thus result in the presence of fewer spaces between primary rings lacking secondary rings, but this does not occur.

The foregoing table suggests that an increase in the 1/d ratio may be correlated with the increase in age (length). That this is not so is indicated by Dunn's table (1942, p. 469), in which large specimens with 1/d ratios both small (26, at 390 mm. length) and large (39, at 275 mm. length) occur in the Oaxaca-Guerrero area. Another possibility suggested, however, is that females have slenderer bodies than males; specimens with ratios from 24 to 29 may be males, those with 33 to 40 females (intermediate ratios are not recorded). The slenderest specimen recorded is one that had just given birth to its young; very probably it represents an exaggerated condition, yet it appeared but very little more robust just before giving birth to its young. A nearly equally slender condition (38, 39) is reached in other specimens collected in August, long after the season when the young are born.

## Order CAUDATA Oppel, 1811

## Family AMBYSTOMIDAE Hallowell, 1858

## Genus SIREDON Wagler, 1830

## SIREDON MEXICANUS (Shaw)

*Gyrinus mexicanus* SHAW, Naturalist's Miscellany, vol. 9, 1798, pls. 343, 344 (México, restricted to Lake Xochimilco).

*Siredon mexicanum* BAIRD, Journ. Acad. Nat. Sci. Philadelphia, ser. 2, vol. 1, 1849, p. 292.

A series of 47 specimens was obtained. Cataloged are U.S.N.M. Nos. 116585-116594 from Lake Xochimilco, D. F., January 25 and September 7, 1939. Another specimen (H.M.S. No. 11336) was purchased September 29, 1939, from a resident of San Andrés Mixcoac, México (near Chalco), in the vicinity of which the specimen was said to have been collected, in a small lake.

A specimen of *Rhyacosiredon altamirani* was given to one of us (Smith) by Dr. Manuel Maldonado K. It purports to have been taken at Lake Xochimilco. If this species occurs there, it may form the basis of oral reports that *Siredon mexicanus* occasionally transforms in nature.

## SIREDON LERMAENSIS Taylor

*Siredon lermaensis* TAYLOR, Univ. Kansas Sci. Bull., vol. 26, No. 12, 1939 (Nov. 27, 1940f), pp. 427-430, pl. 48 (Lake Lerma, east of Toluca, México).

A series of 107 specimens was acquired at the village of Lerma on the edge of Lake Lerma, March 4 and September 30, 1939. These consist of young, neotenic larvae and transformed adults. The adults are present only in the March series. Fifteen specimens (U.S.N.M. Nos. 116570-116584, all topotypes) are cataloged.

The two youngest larvae examined measure 51 mm. from snout to vent; the tail of one measures 41 mm., while that of the other is partly missing. At this age the maxillary-premaxillary teeth are 35-35, well developed, and very unequal in size. The pterygoid teeth, somewhat separated from the vomerine series, reach to the posterior level of the choanae and consist of four short diagonal rows of four teeth, each with one or two rows of two (or one) teeth. The vomerine groups are widened, and each consists of 11 rows of three to six teeth (or if counted in another direction six rows of a varying length with 3 to 11 teeth). The groups are separated by a diastema, medially. The splenial series have about 40 teeth, arranged in short transverse rows of two or three teeth each. The mandibular teeth are similar to the maxillary-premaxillary series in number. They are arranged rather irregularly in the jaw.

In color these young are brownish gray (under the lens the pigment shows as a reticulation, with circular skin glands evident as

cream spots). The chin and venter are much lighter, but some pigmentation is evident under a lens.

A specimen of 62 mm. is dark grayish black above, the belly and limbs a little lighter, but in turn much darker than the chin. The teeth are much the same as in the preceding larva, except that there are more rows of splenial teeth and each of these may have four or five teeth. The palatal pit, indicated in the youngest as a deep, very narrow pit, is larger, but still deep and slitlike. The fold at the corner of the mouth is more ample.

In the largest larvae, 118-125 mm. from snout to vent, the vomerine and pterygoid (palatine) series are arranged in a single more or less continuous row on each side, tending to form a curved arch, broken medially. The splenial series, now with 40 to 45 teeth, are in a single somewhat irregular row.

The smallest transformed specimen measures 78 mm. from snout to vent; the tail, 68 mm. The splenial teeth have disappeared; the vomeropalatine series form an angular arch; however, the two series are narrowly separated medially. The palatal pit is circular, deep, and much larger than the choanae. The tongue has developed.

Another specimen, transforming but with a trace of the gills, measures 108 mm. from snout to vent; tail, 76 mm. It is possible that the last mentioned transformed from a neotenic female, while the first mentioned adult transformed from an immature larva.

### Genus RHYACOSIREDON Dunn, 1928

#### RHYACOSIREDON ALTAMIRANI (Dugès)

*Amblystoma altamirani* DUGÈS, Description d'un axolotl des montagnes de Las Cruces (*Amblystoma altamirani* A. Dugès), Imprimerie du Ministère de "Fomento," 1895, pp. 1-6, 1 pl. ("Manantial de los Axolotes en la Serranía de las Cruces perteneciente al Valle de México").

*Rhyacosiredon altamirani* DUNN, Proc. New England Zool. Club, vol. 10, 1928, pp. 85-86.

A series of 17 specimens comes from the Ajusco range southwest of México (City), chiefly in the vicinity of the Lakes of Zempoala (Cempoala) in Morelos and México. The following are cataloged: Zempoala Lakes, July 25, 1939, and August 28, 1940 (U.S.N.M. Nos. 116599-116612); Desierto de los Leones, D. F., June 9, 1940 (U.S.N.M. Nos. 116597-116598); and Cañada de Contreras, D. F., January 16, 1938 (U.S.N.M. No. 116613). Those from the last two localities were presented to Smith by Dr. Rafael Martín del Campo, of the Instituto de Biología in México (City). One other specimen (H.M.S. No. 12836) is labeled Lake Xochimilco, D. F., 1939 (see discussion of *Siredon mexicanus*).

## RHYACOSIREDON LEORAE Taylor

*Rhyacosiredon leorae* TAYLOR, Univ. Kansas Sci. Bull., vol. 29, pt. 2, 1943b, pp. 345-347, pl. 26, fig. 3 (type locality, mountain stream near Río Frío, México, in the state of Puebla almost on the border between the two states).

Four paratype specimens are in the collection (U.S.N.M. Nos. 116629-116632). These were obtained by Dyfrig McHattie Forbes at the type locality on October 7, 1939.

The adults are extremely shy, hiding under the cut-in edges of the stream at the least disturbance. We visited this stream several times, but its turbulent condition prevented our securing further specimens.

## RHYACOSIREDON RIVULARIS Taylor

*Rhyacosiredon rivularis* TAYLOR, Herpetologica, vol. 1, No. 7, Jan. 29, 1940a, pp. 171-176, pl. 17, fig. 1 (13 km. west of Villa Victoria, México).

Two specimens were obtained at the exact type locality (U.S.N.M. Nos. 116595, 116596) about 13 km. west of Villa Victoria in the recently established Bosencheve National Forest (Kilometer 129), on September 11, 1939. They agree with the type in all essential details.

## RHYACOSIREDON ZEMPOALAENSIS, new species

*Type*.—U.S.N.M. No. 116617, adult larva, collected at the Lakes of Zempoala, Morelos, México, in a nearly dry lake bed, elevation about 10,000 feet, February 24, 1939, by Hobart M. Smith.

*Paratypes*.—U.S.N.M. Nos. 116614-116616, 116618-116628, February 21-24, 1939, H. M. Smith, collector; E.H.T.-H.M.S. Nos. 22172-22190, August 25, 1939, 24630-24634, June 18, 1940, E. H. Taylor and Richard C. Taylor, collectors.

*Diagnosis*.—Somewhat similar to *Rhyacosiredon altamirani* but with slenderer limbs and digits and a somewhat more elongate body; the hindleg brought forward, the toes fail to reach the elbow by about one to three costal folds; the head is slenderer and the tail is much shorter than head and body. The adult is purplish slate to gray-slate above, with chin dark and light; abdomen purplish; the lips, tips of fingers, and narrow subcaudal fin are whitish.

*Description of type*.—Head elongate, rather slender, moderately elevated, the length 19 mm., the greatest width 15 mm.; from tip of snout to nuchal fold, 15 mm.; gills very short, the basal portion about 2.5 mm. long; width between nostrils about equal to the interorbital distance; eye small, its length about two-thirds the distance to nostril; mouth very narrow, the labial fold visible, the upper lip somewhat notched behind the fold; neck fold free for 8 mm. on median longitudinal line, notched medially.

Maxillary-premaxillary series of teeth 20-20, counting absent teeth; the series reaches back to near the anterior level of choanae;

pterygoid series 6-6, separated slightly from the vomerine series, which consists of 14-15 teeth separated medially by a rather wide diastema; a narrow, deep palatine pit. Choanae elongate, the inner edge with a slight outward projection; mandibular teeth about 22-20; the splenial teeth are almost gone, there being but two on one side and four on the other.

Limbs slender, the digits but little flattened; order of lengths of the fingers is 1, 4, 2=3, although the difference in one and four is not great; leg scarcely heavier than arm; in toes the order of length is 1, 5, 2, 4, 3 (on the left foot; right foot abnormal in having the second and third toes very short). Adpressed limbs have toes separated from elbow by  $1\frac{1}{4}$  folds (male) (to  $2\frac{1}{2}$  in females); an inner tubercle at base of palm and sole, outer tubercle absent (present in part of the paratypes).

Tail greatly compressed, slender, the ventral fin reduced to a trace. The dorsal fin low, beginning behind level of insertion of hindlimbs and nowhere reaching an elevation of more than one-fourth of the depth of the tail. Total depth at base of tail (18 mm.) a little more than greatest depth of body (14.6 mm.).

The cloaca (male) is considerably inflated and possesses numerous papillae, which are widened at their bases and somewhat flattened.

*Color.*—Dorsal and lateral surfaces generally uniform purplish black, the color not intense; limbs similarly colored, but of a slightly lighter shade; chin and lower surfaces of limbs partly clouded with light lavender; abdomen purplish lavender (brownish in preserved specimens). The edges of the lips, tips of the digits, and a narrow ventral fin on tail dirty whitish or cream.

*Measurements in mm.*—Snout to posterior end of vent 64; tail 49; width of head 15; length of head 19; axilla to groin 28; arm 20; leg 22.

*Variation.*—The youngest larva measures 40 mm. from snout to vent; tail, 37 mm. The specimen is dark, with numerous light spots, which are more or less connected laterally. The ventral parts are cream. The maxillary-premaxillary teeth are 19-18; the pterygoid 7-9; vomerine about 13-13, these in an irregular row but the pterygoid teeth probably in two rows; splenial teeth about 14-14. The dorsal fin can scarcely be traced as a low flattened ridge to head, but there is appreciable elevation to about middle of back. The neuromast system appears on the head as a series of openings from nostril to above the orbit, another series below the orbit, and one on the lower jaw; the openings are stoma-like. The three lateral trunk systems are probably undeveloped although a few pores can be discerned; in specimens somewhat larger, only occasionally can a pore be discerned, even with proper magnification. Digits of the younger larvae are much more flattened than in the type. Under water a few of the specimens show traces of cloudiness in the coloration; the largest



female has a distinctly mottled tail. Several specimens show abnormalities in the digits.

*Remarks.*—We cannot be certain, but we presume that at least a part of the neotenic population transforms since the three other known forms do. However, in the collections of the other forms secured at the same time of the year, transformed specimens are perhaps more frequently found than the larvae, yet none are present in our series of *zempoalaensis*. In the entire material before us, 37 specimens, there are several sexually mature specimens as attested by the greatly inflated cloacal region in the males, and the presence of large pigmented ovarian eggs in the females. It is, of course, possible that the adults are more terrestrial, although the three other species ordinarily remain in the water after transforming. However, two recently transformed specimens of *Rhyacosiredon altamirani* were found on land under small logs lying partly in water and partly out of the water. The salamanders were only a distance of inches from the water.

The type locality is a spring at the bottom of an old lake, and except for a very small bog area the bottom is a meadow. The spring forms a sluggish stream about 40 feet long, which disappears under some rocks. It seems likely that this species could easily have access to other waters by means of underground connections, regardless of whether they transform and migrate overland.

We do not overlook the possibility that this larval form may not belong to the genus to which we have assigned it, since the "generic" character is to be ascertained only after the loss of the gills.

Although *Rhyacosiredon altamirani* occurs in streams not over a quarter of a mile away, we found none in the lake bed occupied by *zempoalaensis*. The habitats of the two are strikingly different.

#### Genus AMBYSTOMA Tschudi, 1838

##### AMBYSTOMA ORDINARIA Taylor

*Ambystoma ordinaria* TAYLOR, Univ. Kansas Sci. Bull., vol. 26, No. 12, 1939 (Nov. 27, 1940f), pp. 422-424 (4 miles west of El Mirador, near Puerto Hondo, Michoacán).

A series of 41 topotypic larvae comes from the exact type locality, collected September 12, 1939. U.S.N.M. Nos. 116721-116735 have been cataloged. These agree with the type series completely.

This species is at least partially neotenic. Certain of the larval males have the cloacal region inflated equally as much as transformed males, while some larval females contained large pigmented ovarian eggs.

Live specimens placed in alcohol exude a very large quantity of mucus, which forms a thick, fibrous, cheeselike substance. It was especially noticeable on the under surface of the hands and the feet and on the tip of the snout.

## AMBYSTOMA SUBSALSUM Taylor

*Ambystoma subsalsum* TAYLOR, Copeia, 1943a, No. 3, pp. 152-155 (Lake Alchichica, Puebla).

Three paratypic larval specimens are in the collection, from Lake Alchichica, Puebla (U.S.N.M. Nos. 116702-116704). These were collected by Dyfrig McH. Forbes and the authors on March 21, August 14 and 15, 1940.

In life the larvae are golden-yellow and black-spotted. The yellow color fades quickly when they are taken from the water. The adult has a greatly shortened tail, and is black and yellow spotted.

## AMBYSTOMA AMBLYCEPHALA Taylor

*Ambystoma amblycephala* TAYLOR, Univ. Kansas Sci. Bull. vol. 26, No. 12, 1939 (Nov. 27, 1940f), pp. 420-421, pl. 45, fig. 2 (15 km. west of Morelia [Taciúaro], Michoacán).

A series of 137 larvae and transforming young were collected at Taciúaro, Michoacán, the type locality, October 1, 1939; U.S.N.M. Nos. 116705-116720 have been cataloged.

The larvae resemble somewhat those of *Ambystoma velasci*, and like them are not usually neotenic. They are, however, colored differently. The length of the larvae above 60 mm. averages 66.3. Only eight reach 70 mm., the five largest being 72, 72, 75, 75, 77 mm. The length of the transforming young varies, and it is possible that a few larvae may become neotenic. The smallest transforming specimen measured 52 mm., the tail 41 mm.; average size of transforming young about 65 mm., the tail 51.6 mm. The smallest transformed specimen measured 58 mm., tail 44 mm.; the largest 92 mm., tail 71 mm., which approximates the measurements of the type (90 mm. and 71 mm., for the same measurements). All these possess remnants of the gills.

The dentition of the young larvae (50 mm., tail 41 mm.) follows: Vomerine teeth about 52-52, arranged in 8 rows, 3 to 15 teeth in each; pterygoid teeth 25-25, arranged rather irregularly, separated from the vomerine teeth; maxillary-premaxillary teeth about 36-36, rather irregular, perhaps two rows in front part of mouth; splenial teeth about 54-54, arranged in three or four long irregular rows; mandibular teeth 36-36. At this size the body is yellowish fawn, the dorsal and ventral caudal fins blackish.

In a larva of 70 mm. the dentition is: (about) maxillary-premaxillary, 45-45; vomerine, 56-58; pterygoid, 43-43; splenial, 72-72; mandibular, 46-46.

In the transforming specimens the pterygoid (palatine) series is greatly reduced, as is also the vomerine series. In some only a few teeth remain. Many of the maxillary teeth are apparently lost and the entire splenial series is lost. It is presumed that the adult dentition is partially, if not wholly, acquired during or after trans-

formation. The maxillary teeth are increased by additions to the posterior end of the series.

The transforming specimens have a dark gray to blackish venter, with irregular, ventrolateral cream lines, which may be broken up into cream spots. The body may be gray, grayish black, or blackish, with few or many cream spots on the sides and tail.

A reexamination of one rather desiccated paratype (E.H.T.-H.M.S. No. 16442) discloses the presence on one side of five phalanges in the fourth toe, and four in the third finger, instead of the normal number of four and three, respectively; the phalangeal formulae of the hands are 2-2-4-2, 2-2-3-2, and of the toes 2-2-3-5-3, 2-2-3-4-3. We regard this as an anomaly; however, larger series of fully adult specimens may show that we have confused two species.

AMBYSTOMA VELASCI Dugès

PLATE 18, FIGURES 3, 4

*Siredon tigrina* VELASCO, La Naturaleza, vol. 4, 1879, p. 216 (Laguna Santa Isabel, Guadalupe Hidalgo, Distrito Federal).

*Ambystoma velasci* DUGÈS, La Naturaleza, ser. 2, vol. 1, 1888, p. 142 (type locality that of *Siredon tigrina* Velasco).

*Ambystoma tigrinum velascoi* WOLTERSTORFF, Abh. Ber. Mus. Magdeburg, vol. 6, No. 2, 1930, p. 132, fig. 3, pl. 2, figs. 2-3, pl. 3, fig. 3 (*part*).

It is with considerable hesitancy that we are referring to *Ambystoma velasci* two series of specimens, the first constituting a series of 121 larvae, with a few transforming young, from La Virgin, Puebla (about Kilometer 224, 28 km. north of Tehuacán), and the second consisting of 189 specimens of larvae and transforming young from the region about Lake Texcoco in the Valle de México. Of the entire series, the following specimens have been cataloged: PUEBLA: U.S.N.M. Nos. 116692-116701, La Virgin, August 21, 1939 (all larvae), and March 24, 1940 (numerous transforming). MÉXICO: U.S.N.M. Nos. 116654-116667, Santa Magdalena, near Lake Texcoco, in roadside pools, August 23, 1939; U.S.N.M. Nos. 116608-116690, San Diego, March 2 and August 23, 1939. DISTRITO FEDERAL: U.S.N.M. No. 116691, Atzacualco, October 6, 1939.

We do not follow Wolterstorff (*loc. cit.*) in regarding this species as having a subspecific relationship with *Ambystoma tigrinum*. We believe that in the assemblage of specimens referred by Dunn (1940, p. 157) to this form other species are probably involved.

From the pond at San Diego two giant specimens presumably of this species were taken (E.H.T.-H.M.S. Nos. 22210-22211). These apparently are sexually mature. The size of the largest is 144 mm. from snout to vent; tail, 108 mm. No other neotenic specimens were encountered. No adequate series of fully transformed specimens are available for studies in variation. The Puebla larvae are lighter, with less marking than those from the Valley of México.

We were unable to obtain material from the type locality at Santa Isabel. However, the figures of the species given by Velasco (*loc. cit.*) show a larger, highly colored animal and larger transformed specimens that appear different from the transformed young in this collection. It may be that we err in thus associating these forms. The matter cannot be settled at this time.

We are of the opinion that the cause for specific differentiation of the species of ambystomid salamanders from the ancestral stock is largely the varied salt and acid content in the different *permanent* bodies of water occurring in the Valley of México.

AMBYSTOMA LACUSTRIS, new species

PLATE 18, FIGURES 1, 2

*Type*.—U.S.N.M. No. 117410, collected at Lake Zumpango, México, by Dr. and Mrs. Hobart M. Smith, March 3, 1939; recently transformed young.

*Paratypes*.—U.S.N.M. Nos. 116736–116755, collected at Lake Zumpango, by Dr. and Mrs. Hobart Smith; E.H.T.–H.M.S. Nos. 22894–22910, Hobart M. Smith and E. H. Taylor, same locality.

*Diagnosis*.—A neotenic salamander of large size capable of transformation. Limbs relatively short in proportion to body length, the fingers of adults overlapping about length of second finger when limbs are adpressed; caudal fin small and part may be retained in old adults. Tail elongate, rather slender, a little less than snout to vent length; vomerine teeth arched, with a median diastema; choanae very large; elongate; body not elevated in the middle; tail widest at base.

*Description of type*.—A large, recently transformed young (107 mm. from snout to vent; total length 198 mm.); gill slits closed, but three small beadlike remnants of the gills still visible on each side. Head thick posteriorly, the depth 20 mm. at angle of jaw; greatest width of the head (25 mm.) less than length to base of gills (28 mm.); eyes elevated somewhat, the interorbital width (9 mm.) a little less than length of snout (10 mm.); eye to nostril, 5.5 mm.; distance between nostrils, 10 mm.; gular fold prominent, the skin of chin folded longitudinally; vomerine teeth in two series beginning behind anterior level of choanae and running forward, tending to form an arch; however, there is a distinct diastema which is at a point bordering edge of the palatal pit; about 17 teeth in each series; palatine teeth diagonally placed, about 11 on each side, and practically continuous with the vomerine series. Choanae very large, elongate-oval, lying somewhat diagonally; tongue beginning to develop but still very small; maxillary-premaxillary teeth about 55–55, the series continued to a point posterior to the posterior level of the choanae; mandibular teeth about 58–58. Many of the teeth have not yet pierced the gums; splenial teeth have disappeared; there is a remnant of an upper larval flap at the poste-

rior corner of mouth on upper jaw; and on lower, a part of the larval fold which is present in larvae joined to the upper; an indistinct groove from eye to angle of the mouth.

Arms relatively short, the fingers moderately elongate; terminal third of metacarpals free on two middle fingers, and somewhat more on two outer fingers; order of size 1, 4, 2, 3; tubercles on palm small, distinct, the digits somewhat flattened and pointed but the points rounded; limbs adpressed, the leg reaches to the base of third finger; metatarsals of three middle toes involved in web; the extreme anterior part of metatarsals free on two outer toes; order of size of toes 1, 5, 2, 4=3; toes flattened, pointed; a ridge bordering outer toe continued onto the tarsus for a little distance; two tubercles on posterior part of sole, elevated, rounded; 12 costal grooves evident high on sides and continued across abdomen; a distinct, median dorsal, longitudinal groove or depression from occiput to base of tail. Skin of head smooth, with traces of pits bordering inner edge of orbit; apparently no trace of the lateral-line organs. Outer part of walls of cloaca with a few vertical folds; deeper parts with more numerous folds. Dorsal caudal fin very low, not rising to a greater elevation than base of tail; ventral caudal fin wanting. Glands of the skin are of two visible sorts, a larger cream-colored type of gland, and a smaller type of a gray color. Both appear somewhat circular and give the skin a characteristic pattern.

*Color in alcohol.*—Above dull brownish olive, with the cream and grayish glands appearing as very minute dots; on venter and half way up on sides the color is a dirty cream; arms lighter olive than body. A few dark flecks or spots on head and on back, while the sides of the compressed tail are mottled with olive-black. The lower part of the tail lighter olive than upper part; lips somewhat lighter than snout.

*Measurements in mm.*—Snout to vent 107; tail 82; head length 28; head width 25; head depth 20; axilla to groin 51; snout to arm 32; leg 34.

*Larvae.*—The largest larva, U.S.N.M. No. 116741, measures 133 mm. from snout to vent; tail, 108 mm.; head width, 35 mm.; depth of head, 25 mm.; length of head (to base of last gill), 44 mm.; snout to median notch of gular fold, 36 mm.; arm, 36 mm.; leg, 38 mm.; axilla to groin, 63 mm.; 12 costal grooves. Dorsal fin can be traced to a point about 25 mm. behind level of arm insertion. At base of tail the dorsal fin is about 5 mm. high; the greatest elevation about midway of the tail is 7.5 mm; greatest depth of subcaudal fin 8.5 mm.; greatest depth of tail, 23 mm.; greatest depth of body, 34 mm.; the limbs adpressed, the longest toe reaches the wrist; digits webbed as in adults, except there is a lateral fold evident along some of the digits and the toes are wider, and the fourth toe is longer than the third.

Vomerine and palatine series of teeth nearly continuous except for a median diastema; choanae elongate longitudinally; about 20-22 palatine teeth; about 43-43 vomerine teeth, both series irregular; maxillary-premaxillary teeth about 70-70; mandibular series about same, but many teeth hidden by gums; no tongue.

The specimen is a female with nearly mature ovarian eggs; the cloacal region is folded, with some papillae or papillate folds. U. S. N. M. No. 116755 has numerous black ocelli on head and back and on dorsal fin. A few other adult larval specimens show the same ocelli; some of the younger specimens show traces of the upper dorsal series of neuromast organs.

In a young specimen the vomerine series are widened, the teeth tending to form six or seven diagonal series; the pterygopalatine teeth are likewise arranged in several irregular series; length 85 mm. snout to vent.

*Remarks.*—The neotenic and other larvae occurring in Zumpango are referred to this form although there is no absolute proof of conspecificity. All the larvae, despite certain apparent differences, seem to belong to a single species. The species must be regarded as one apart from *Ambystoma velasci*. The coloration and markings of both young and adult are different; the shape of the body and head, the longer, slenderer tail, and the very different character of the transformed adults confirm the fact that two different animals are involved. Differences between this species and *A. ordinaria* and *A. amblycephala* are such that there is no opportunity for confusing them. There may be a relationship with *A. bombyppella*, but differences in color markings and the character of skin and tail amply distinguish them.

## Family PLETHODONTIDAE Gray, 1850

### Genus THORIUS Cope, 1869

#### THORIUS PENNATULUS Cope

*Thorius pennatulus* COPE, Proc. Acad. Nat. Sci. Philadelphia, vol. 21, 1869a, pp. 111-112 (Orizaba, probably near the city).

An extraordinary series of 723 specimens was collected on the side of a peak in the valley near Cuautlapan, Veracruz, in January, February, July, and August 1940. These specimens were found under débris of various types, and very frequently around the edges of boulders under living plants, which often formed a thick mat about the boulders.

Cataloged in the collection are U.S.N.M. Nos. 111012-111037, 111039-111067. U.S.N.M. No. 111017 is designated a neotype, since no authentic types are known to exist.

This is the most diminutive salamander yet discovered in México. There are 13 well-defined costal grooves, strongly pendant swellings on

the lips below nostrils in males, and a large single median curving tooth piercing the upper lip. A large female, measuring 21 mm. snout to vent, contained six eggs, three in each ovary.

Of the three species of this genus occurring in the mountains in this part of Veracruz all have the chin more or less speckled with small cream spots. Only *pennatulus* has the underside of the body, and to some extent the sides, so marked.

#### THORIUS NARISOVALIS Taylor

*Thorius narisovalis* TAYLOR, Univ. Kansas Sci. Bull., vol. 26, No. 12, 1939 (Nov. 27, 1940f), pp. 416-418, pl. 47, fig. 3 (Cerro San Felipe, Oaxaca).

Two topotypic specimens from the Cerro San Felipe, Oaxaca, collected July 10-20, 1940, are U.S.N.M. Nos. 116454, 116455. This form occurs on Cerro San Felipe at a considerably higher elevation than *Thorius pulmonaris*. The latter species is terrestrial, invariably found in masses of wet leaves; *T. narisovalis* on the other hand was almost invariably found under logs or the loosened bark of logs. When uncovered they usually made prodigious leaps.

The specimen in the National Museum from Cerro San Felipe, Oaxaca (U.S.N.M. No. 47608), referred by Dunn (1926, p. 376) to *Oedipus pennatulus*, belongs to *T. narisovalis*.

#### THORIUS PULMONARIS Taylor

*Thorius pulmonaris* TAYLOR, Univ. Kansas Sci. Bull., vol. 26, No. 12, 1939 (Nov. 27, 1940f), pp. 411-414, figs. 3-4 (Cerro San Felipe, Oaxaca).<sup>1</sup>

Three topotypic specimens, U.S.N.M. Nos. 116451-116453, are in the collection from Cerro San Felipe, near Oaxaca, Oaxaca, collected July 10-20, 1940. The elongate-oval nostril, diagonally placed, easily distinguishes this form from other members of the genus.

The specimen (U.S.N.M. No. 47797) from Reyes, Oaxaca, referred by Dunn (1926, p. 376) to *Oedipus pennatulus*, belongs to *T. pulmonaris*.

#### THORIUS TROGLODYTES Taylor

##### PLATE 19

*Thorius troglodytes* TAYLOR, Univ. Kansas Sci. Bull., vol. 27, pt. 1, No. 7, 1941d, pp. 110-112, pl. 3, fig. 4 (Acultzingo, Veracruz).

Thirty-three specimens were collected. Cataloged are 16 topotypic paratypes, from near Acultzingo (U.S.N.M. Nos. 110969-110983, 110992), collected January 15-18 and August 19, 1939; 9 others are practically topotypes, but were collected a kilometer or two (straight line) away, within the boundary of the state of Puebla, near a spot named Pájaro Verde (U.S.N.M. Nos. 110960-8), in January and December 1939. They were obtained from under rocks, chip piles, and moist leaves.

## THORIUS DUBITUS Taylor

*Thorius dubitus* TAYLOR, Univ. Kansas Sci. Bull., vol. 27, pt. 1, No. 7, 1941d, pp. 108-110, pl. 3, fig. 3 (Acultzingo, Veracruz).

A series of 54 topotypic specimens was collected on August 19, 1939. Of these 27 were in Taylor's hands when the species was described and are paratypes. These alone are cataloged and bear U.S.N.M. Nos. 110984-110991, 110993-111011. These specimens were collected in moss and among the roots of plants growing on the surface and forming a heavy mat. They are from very near the top of the ridge to the southwest of Acultzingo, Veracruz. One of the series (U.S.N.M. No. 111011) was collected within the boundary of the state of Puebla near Pájaro Verde.

The curious habit of this form, of coiling its body in a watch-spring spiral, was observed in almost every specimen encountered.

## Genus BOLITOGLOSSA Duméril and Bibron, 1854

## BOLITOGLOSSA LEPROSA (Cope)

*Speleperpes leprosus* COPE, Proc. Acad. Nat. Sci. Philadelphia, vol. 21, 1869a, pp. 105-106 ("Orizaba," probably Mount Orizaba).

*Bolitoglossa leprosa* TAYLOR, Univ. Kansas Sci. Bull., vol. 27, 1941e, p. 143.

In all, 320 specimens were secured from the following localities (only a part of the series has been cataloged and now bears the following numbers): DISTRITO FEDERAL: Valle Alegre, July 23, 1939 (U.S.N.M. No. 117397); Desierto de los Leones, June 16, 1940 (U.S.N.M. No. 117398). MÉXICO: Lake Zempoala, February 21-22 and August 25, 1939, July 28, 1940 (U.S.N.M. Nos. 116267-116277); Llano Grande, August 21, 1939 (U.S.N.M. Nos. 116252-116261); Mount Popocatepetl, September 7 and October 8, 1939 (U.S.N.M. Nos. 116237-116251). PUEBLA: 2 miles east of Río Frío, México, August 26, 1939 (U.S.N.M. Nos. 116262-116266). VERACRUZ: Cruz Blanca, March 24, 1940 (U.S.N.M. Nos. 117390-117396); 17 km. northeast of El Limón, Totalco, March 23, 1940 (U.S.N.M. Nos. 117383-117389).

One of us (Taylor, 1939a, pp. 280-283) formerly regarded *orizabensis* as a species separable from *leprosa*. Examination of large series of specimens (E. H. T.-H. M. S. collection) shows that the presumed specific characters originally observed break down in large series and were perhaps chiefly due to age and sex. We now regard it a synonym of *leprosa*.

This species and *B. chiroptera* are the two commonest salamanders of the high plateau region of México. They are found in identical habitats.

## BOLITOGLOSSA NIGROMACULATA Taylor

*Bolitoglossa nigromaculata* TAYLOR, Univ. Kansas Sci. Bull., vol. 27, pt. 1, No. 8, Nov. 1, 1941e (actual mailing date, Dec. 1941), pp. 141-145, fig. 1, A, B (Cuautlapan, Veracruz).



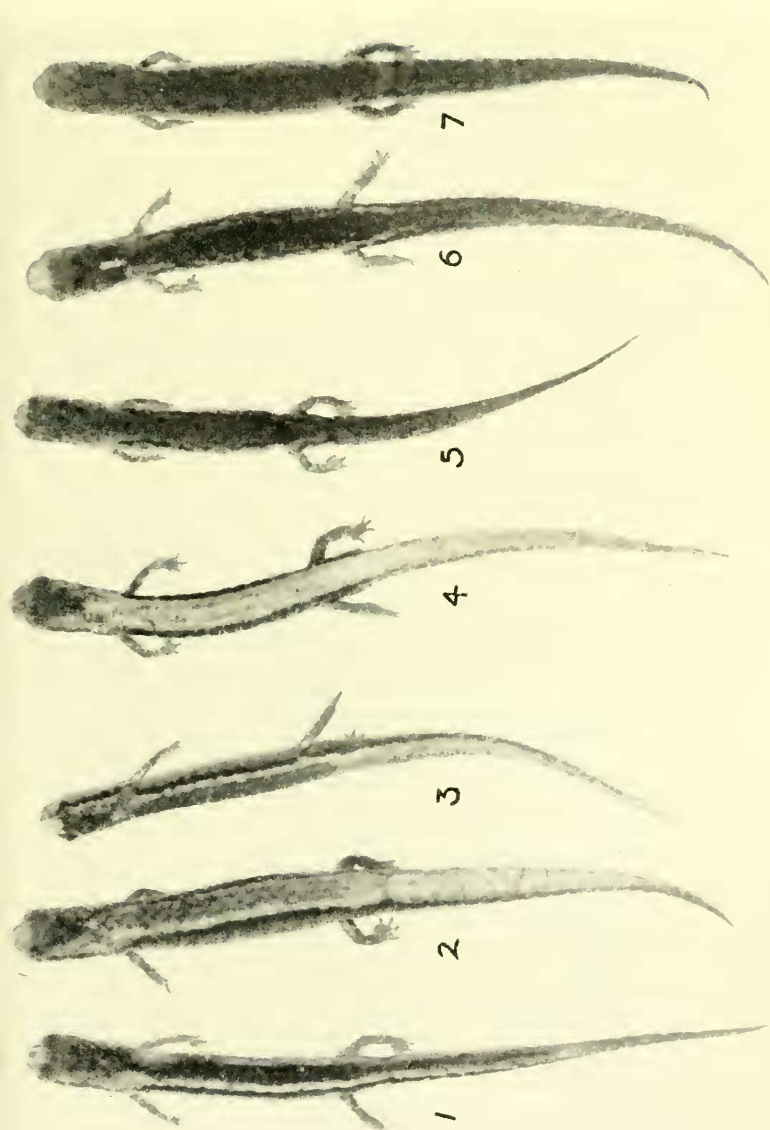


1, 2, *Ambystoma lacustris*, new species; 1, U.S.N.M. No. 117410, type, from Lake Zumpango, México, México, total length 198 mm.; 2, U.S.N.M. No. 116738, larva, from same locality, total length 238 mm.

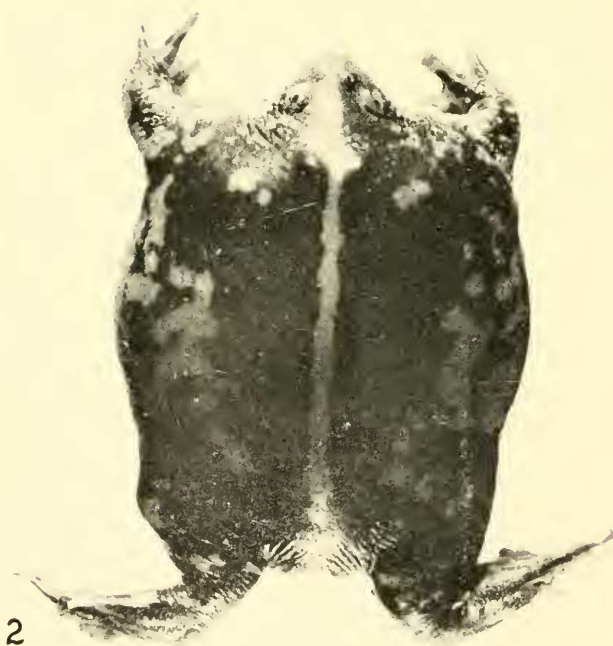
3, 4, *Ambystoma velasci* Dugés; 3, U.S.N.M. No. 116683, from fresh-water pond near San Diego, D. F., total length 110 mm.; 4, U.S.N.M. No. 116689, from same locality, total length 125 mm.



Paratypes of *Thorioides troglodytes* Taylor from crest of mountains near Aculizingo, Veracruz: 1, U.S.N.M. No. 110977; 2, H.M.S. No. 11791; 3, U.S.N.M. No. 110969; 4, U.S.N.M. No. 110999, actual total length 53 mm.; 5, U.S.N.M. No. 110970; 6, U.S.N.M. No. 110978; 7, U.S.N.M. No. 110968.



*Bolitoglossa terrestris* (Taylor): 1, E.H.T.-H.M.S. No. 17708, from 4-5 miles south of Zacualtipán, Hidalgo; 2, E.H.T.-H.M.S. No. 23374, from 4-10 miles south of Tianguistengo, Hidalgo; 3, E.H.T.-H.M.S. No. 23232, same locality; 4, E.H.T.-H.M.S. No. 23261, from 4-5 miles south of Zacualtipán, Hidalgo; 5, E.H.T.-H.M.S. No. 23336, from 4-10 miles south of Tianguistengo, Hidalgo; 6, E.H.T.-H.M.S. No. 23367, same locality; 7, E.H.T.-H.M.S. No. 17721, from 4-5 miles south of Zacualtipán, Hidalgo.



1, *Bufo canaliferus* Cope: E.H.T.-H.M.S. No. 156, from Tonalá, Chiapas, snout-to-vent length 47.5 mm.

2, *Rhinophrynus dorsalis* Duméril and Bibron: E.H.T.-H.M.S. No. 10, from Rodríguez Clara, Veracruz, snout-to-vent length 70 mm.

Of an original series of 11 specimens, the type and paratypes, U.S.N.M. Nos. 110635 (type) and 110631–110634, 110636–110639, are in the collection from Cuautlapan, Veracruz, taken in January and February 1940. The specimens are from the nearby mountain tops rather than from the narrow valley in which the village of Cuautlapan lies, and from an elevation possibly a thousand feet higher.

Two of the cotypes of *Spelerpes leprosus* Cope (1869a, pp. 105–106), which are now U.S.N.M. No. 6340, belong to this species.

**BOLITOGLOSSA ROBERTSI (Taylor)**

*Oedipus robertsi* TAYLOR, Univ. Kansas Sci. Bull., vol. 25, No. 14, 1938 (July 10, 1939a), pp. 287–289, pl. 26, fig. 2 (Nevado de Toluca, 10,000 to 11,000 feet elevation).

The six specimens of this series (U.S.N.M. Nos. 116231–116236) are topotypes, collected October 2, 1939. The broad dorsal stripe varies from dull orange to orange-brown, but much of this color is lost by preservation. These specimens were found under rocks and logs, usually directly on the ground.

**BOLITOGLOSSA COCHRANAE Taylor**

*Bolitoglossa cochranae* TAYLOR, Univ. Kansas Sci. Bull., vol. 29, pt. 2, No. 8, 1943b, pp. 343–345 (Cerro San Felipe, Oaxaca, Oaxaca).

U.S.N.M. No. 116386 is a paratopotype, collected July 10–20, 1940.

**BOLITOGLOSSA BELLII (Gray)**

*Spelerpes bellii* GRAY, Catalogue of the Batrachia Gradientia in the British Museum, 1850, p. 46 (México).

*Bolitoglossa bellii* TAYLOR, Proc. Biol. Soc. Washington, vol. 54, 1941f, p. 77.

The collection has U.S.N.M. No. 116227 from 12 miles west of Villa Victoria, México, March 6, 1939; U.S.N.M. No. 116228 from Nevado de Toluca, México, October 2, 1939; U.S.N.M. No. 116229 from 4 miles east of Carapa, Michoacán, September 12, 1939; and U.S.N.M. No. 116230 from Omilteme, Guerrero, August 2–4, 1940.

This species is distinguished by a pair of red spots on the head; the body is elongated so that the adpressed limbs are separated by three or four costal folds; and it probably attains as large a size as *B. gigantea*.

The specimens were usually found under clumps of dead grass pulled up by local workmen to obtain the roots.

We have examined one specimen from Mount Zempoaltepec, Oaxaca (U.S.N.M. No. 46924), which has a large red spot laterally on the shoulder above the arm as well as a pair of occipital spots. The body is crossed by transverse, somewhat chevron-shaped, red bars, which continue some distance on the tail. This same form occurs also on the Cerro San Felipe, as exemplified by a very young

specimen in the E.H.T.-H.M.S. collection (No. 29986). A series of specimens may show that these belong to a separable form.

**BOLITOGLOSSA GIGANTEA (Taylor)**

*Oedipus giganteus* TAYLOR, Univ. Kansas Sci. Bull., vol. 25, No. 14, 1938 (July 10, 1939a), pp. 266-269, pl. 27, figs. 3, 4 (Jalapa, Veracruz).

*B[olitoglossa] gigantea* TAYLOR, Univ. Kansas Sci. Bull., vol. 27, pt. 1, No. 7, 1941d, p. 112.

This species is represented by 28 specimens: HIDALGO: U.S.N.M. Nos. 116349-116366, 6 km. south of Santa Anita, October 10 and December 13, 1939. VERACRUZ: U.S.N.M. Nos. 116347-116348, 17 km. northeast of El Limón (Totalco), March 23, 1940; U.S.N.M. Nos. 116339-116345, Pan de Olla, March 22, 1940; and U.S.N.M. No. 116346, Tequeyutepec, March 23, 1940.

This species, readily distinguishable from *B. bellii* by the shorter body and the absence of red spots on the head, appears to be confined to the states of Hidalgo, northern Veracruz, and Puebla. Only one of the 28 specimens has any trace of spots on the head, and that is a juvenile from northern Hidalgo. In all males the adpressed limbs are in contact; in females they usually touch; but in old or gravid females they may be separated by one or two folds.

The largest specimen seen, a female (U.S.N.M. No. 116347), measures 161 mm. from snout to the posterior end of the vent, the tail 115 mm.; the head width is 28 mm. The vomerine teeth (35-40) are in very irregular rows; the maxillary-premaxillary teeth, 70-71; mandibular teeth 65(+)-70. The adpressed limbs are separated by about two costal folds.

Field notes record that the dorsal spots are orange instead of red as in *bellii*.

**BOLITOGLOSSA CEPHALICA CEPHALICA (Cope)**

*Spelerpes cephalicus* COPE, Proc. Acad. Nat. Sci. Philadelphia, vol. 17, 1865a, p. 196 (Mexican Tableland).

Thirty specimens, the following cataloged: DISTRITO FEDERAL: Valle Alegre, Ajuseco, July 23, 1939 (U.S.N.M. No. 116115). MÉXICO: 10 miles west of Villa Victoria, September 11, 1939 (U.S.N.M. Nos. 116106-116107); Mount Popocatepetl, October 8, 1939 (U.S.N.M. Nos. 116101-116102); Lake Zempoala, August 25, 1939 (U.S.N.M. Nos. 116099-116100). PUEBLA: 2 miles east of Río Frío, México, October 21, 1939 (U.S.N.M. Nos. 116103-116105). VERACRUZ: 2 km. west of Acultzingo, August 28 and December 19, 1939 (U.S.N.M. Nos. 116116-116118); Cruz Blanca, March 24, 1940 (U.S.N.M. No. 116109); Pan de Olla, March 22, 1940 (U.S.N.M. Nos. 116108, 116119-116126); 17 km. northeast of El Limón (Totalco), March 23, 1940 (U.S.N.M. Nos. 116110-116112); Tequeyutepec, March 23, 1940 (U.S.N.M. Nos. 116113-116114).

The species has been found chiefly in or under rotten logs, under stones, and under clumps of dead grass.

One of the cotypes (now U.S.N.M. No. 103591) of *Spelerpes leprosus* Cope (1869a, pp. 105–106) belongs to this species.

**BOLITOGLOSSA CEPHALICA RUBRIMEMBRIS, new subspecies**

*Type*.—U.S.N.M. No. 110661, female, collected 6 km. south of Santa Anita, Hidalgo, elevation about 4,500 feet, October 10, 1939, by Dr. and Mrs. Hobart M. Smith.

*Paratypes*.—U.S.N.M. Nos. 110659–110660, collected with the type; E.H.T.-H.M.S. Nos. 25411–25413, topotypes; E.H.T.-H.M.S. No. 12495, Minas Viejas, Hidalgo, July 1, 1940; E.H.T.-H.M.S. No. 23007, 6 miles south of Santa Anita, Hidalgo, September, 1939; E.H.T.-H.M.S. No. 29831 near Zacualtipán, Hidalgo, July 2, 1940.

*Diagnosis*.—A medium-sized salamander similar to *B. cephalica cephalica*, but with the greater portion of limbs and posterior third or fourth of the tail red. The adpressed limbs touch or overlap a distance equal to the width of a costal fold.

*Description of the type*.—Body short, the maximum known length being 53 mm.; tail 38 mm.; head short, the eye (3 mm.) greater than length of mouth; nostrils small, the groove running from the posterior part down to the indistinct subnarial swelling; head broad, its width 9 mm.; length of head to the neck groove, 12 mm.; posterior part of eyelids inserted under a diagonal fold; interorbital width, about one and one-half times the width of a single eyelid; a strongly defined groove begins on side of head behind eye and runs down, crossing jaw angle, thence across the chin; the groove emerging from nuchal fold runs up and somewhat forward to the median line; an indistinct irregular groove runs back from near eye to the lateral edge of nuchal fold; the posterior extension of the hyoid forms a ridge, visible as far back as the first intercostal fold behind the arm; 11 well-defined costal grooves, those in axilla and groin apparently lacking; skin between grooves on sides folded longitudinally; sides of cloaca with diagonal folds; a small gland behind insertion of femur.

Maxillary-premaxillary teeth about 40–40; mandibular teeth about 40–44; vomerine teeth 16–? (series partly destroyed on one side), the outer teeth extending beyond outer level of choanae; the parasphenoid teeth in two series, widened posteriorly, narrowed anteriorly, separated from each other by a narrow space; a total of about 95 teeth.

Limbs rather long, when adpressed to the body the toes and fingers touch; length of fingers in following order of size 1, 4, 2, 3; the toes 1, 5, 2, 4, 3; digits broad, rounded at tips, the basal web involving all but tip of first finger and toe, and part of the proximal phalanx of the other digits; it includes nearly two-thirds of that of the fourth toe; a constriction about base of tail; about 22 grooves on tail; skin of

head very distinctly pitted, as is the lateral region of body; pits on dorsal surface of back dim, while the skin of the abdomen is shiny, smooth; small pits on skin on underside of tail.

*Variation.*—The young of this form (and related forms of the *B. cephalica* group of the genus) have the vomerine teeth in two to four series, running somewhat diagonally, and often more numerous than in the adult. As the specimens grow older the teeth tend to form a single, often somewhat irregular, series.

Adult males have the typical narrow head of the group, the snout sharply truncate, with prominent subnarial swellings. The submental gland is well defined, and the cloacal walls are papillate. The limbs are somewhat longer and overlap the width of a costal fold in the largest specimen.

The red color of limbs and tail fades in preservative; however, there usually remains a lighter tail termination and cream spots on the underside of the leg.

*Data on type and paratypes of B. c. rubrimembris*

Character	U.S.N.M. No.					
	110661	23007	12495	29831	110659	110660
Sex.....	♂	♂	♂	♂	♂	♂
Snout to vent length (mm.).....	53	50	47	45.5	39.5	37
Tail length (mm.).....	38	43	38	37	35	35
Snout to nuchal fold (mm.).....	12	14	12	11.1	9.9	10
Snout to foreleg (mm.).....	15.6	17	14	14	12	12.1
Length of snout (mm.).....	2.5	3.4	2.8	2.4	2.3	2.3
Width of head (mm.).....	9	8	8.8	8.6	7.5	7.1
Interorbital width (mm.).....	3	3	2.6	2.7	2.1	2.3
Eyelid (mm.).....	1.8	1.9	1.8	2	1.7	1.8
Arm (mm.).....	13.5	15	12.2	11	9.8	10.5
Leg (mm.).....	15.8	16	13.2	13.2	11.2	11
Axilla to groin (mm.).....	29	26.2	28	24	22	21
Head width in length.....	5.72	6.2	5.32	5.3	4.7	5.2
Head length in length.....	4.5	3.5	3.9	4.1	4	3.7
Maxillary-premaxillary teeth.....	44	41	33	33	36	41
Vomerine teeth.....	16	14	15	15	19	23
Mandibular teeth.....	44	42	33	39	40	38
Parasphenoid teeth in two groups.....	Yes	Yes	Yes	Yes	Yes	Yes
Limbs touch.....	Yes	Yes	Yes	Yes	Yes	Yes
Costal grooves.....	11	11	11	11	11	11
Tail grooves.....	22+	26+	19+	21+	23+	23+
Vomerine teeth in series.....	1	1	2	1	2	2

Certain specimens from near Durango, Hidalgo, seem to show characters that point to *B. cephalica cephalica*, as well as to the form here described. In consequence we suspect intergradation with this form occurring in Querétaro and México.

The three specimens in the National Museum collection were found under stones in a grassy, unforested ravine at 4,500 feet elevation, in company with *Bolitoglossa gigantea*. The form has a very peculiar



mode of locomotion, which was also observed in *B. galeanae*. The tip of the tail is narrowed and somewhat attenuated and is differently colored from the remainder of the tail. The tip of the tail and perhaps the coloration appear to be linked with a special locomotor adaptation. As the animal moves forward in normal, unmolested walking, the tail is held straight back except for the terminal half inch or so, which is flipped forward with each step made by one particular leg. Upon being swung forward into position, the tip is placed on the ground, and then by straightening and pivoting on the tip the tail pushes the body forward as another step is taken. Unfortunately we did not observe whether the pushing movement of the tail is synchronized with one of the forelegs or with one of the hindlegs, but we suspect with the former, since the forelegs are somewhat weaker than the hindlegs.

**BOLITOGLOSSA GALEANAE** Taylor

*Bolitoglossa galeanae* TAYLOR, Proc. Biol. Soc. Washington, vol. 54, July 31, 1941b, pp. 83-85 (Galeana, Nuevo León). (Specific name misspelled by typographical error; should read *galeanae*.)

Nineteen paratypes were collected 15 miles southeast of Galeana, Nuevo León, October 13-14, 1939 (U.S.N.M. Nos. 119642-119658 cataloged). These were found in a semiarid region of little vegetation, rocky, barren soil, small bushy shrubs, and cactus. The area is so completely unlike salamander country that the discovery of the salamanders came as a complete surprise. The specimens were found under stones in company with *Tantilla wilcoxi rubricata*, *Salvadora lineata*, and *Syrrhophus smithi*. The collecting was done during and shortly after a rainstorm in the middle of a week of continued cloudiness and intermittent, drizzling showers. Most of the year the soil is obviously very dry. Since there are no bromelias about, it would be very interesting to know how the salamanders manage to survive the unfavorable climate.

This form belongs to the *B. cephalica* subgroup and is probably the largest species.

**BOLITOGLOSSA GADOVII** (Dunn)

*Oedipus gadovii* DUNN, The salamanders of the family Plethodontidae, 1926, pp. 437-439 (Xometla, 8,500 feet on Mount Orizaba).

[*Bolitoglossa*] *gadovii* TAYLOR, Herpetologica, vol. 2, No. 3, 1941a, p. 58.

Two specimens from Sierra Negra, Mount Orizaba, Puebla, July 22, 1938 (U.S.N.M. Nos. 116384, 116385), are in the collection. They were collected by Taylor.

**BOLITOGLOSSA SMITHI** (Taylor)

*Oedipus smithi* TAYLOR, Univ. Kansas Sci. Bull., vol. 25, No. 14, 1938 (July 10, 1939a), pp. 269-272, pl. 25, figs. 5-6 (Cerro San Luis, Oaxaca, Oaxaca).

*Bolitoglossa smithi* TAYLOR, Univ. Kansas Sci. Bull., vol. 26, No. 12, 1939 (1940f), p. 418.

A single specimen of this species, U.S.N.M. No. 116382, is from Cerro San Felipe, Oaxaca, collected July 10–20, 1940, by E. H. Taylor. *B. smithi* superficially resembles *B. unguidentis* but may readily be separated by the character of the premaxillary teeth, and the longer body and shorter legs, which fail to touch by four costal grooves. There is also less webbing on the toes. The frontal bones bordering the frontoprefrontal fontanelle bend down and form sutures with the prevomers.

To this species belong two specimens (U.S.N.M. Nos. 47606, 47607) from Cerro San Felipe, Oaxaca, previously referred (Dunn, 1926, pp. 364–366) to *Oedipus sulcatus*.

**BOLITOGLOSSA MELANOMOLGA** Taylor

*Bolitoglossa melanomolga* TAYLOR, Proc. Biol. Soc. Washington, vol. 54, July 31, 1941b, pp. 81–83 (20 km. north of San Antonio Limón [Totalco], Veracruz).

Two paratypes, one a topotype from near Teziutlán (June 25, 1940) and one taken at a point 17 km. north of San Antonio Limón (March 24, 1940), are in the collection. These bear U.S.N.M. Nos. 110641 and 110640, respectively.

**BOLITOGLOSSA UNGUIDENTIS** Taylor

*Bolitoglossa unguidentis* TAYLOR, Herpetologica, vol. 2, No. 3, March 25, 1941a, pp. 57–62, figs. 1–3 (Cerro San Felipe, Oaxaca, Oaxaca).

One topotypic specimen, U.S.N.M. No. 116383, from Cerro San Felipe, Oaxaca, July 10–20, 1940, is in the collection. It is entirely typical. The curious bifid or hooked character of the premaxillary teeth of *unguidentis*, *melanomolga*, *smithi*, and *gadovii* shows their very close relationship.

**BOLITOGLOSSA CHIROPTERA** (Cope)

*Spelerpes chiropterus* COPE, Proc. Acad. Nat. Sci. Philadelphia, vol. 15, 1863, p. 54 (Mirador, Veracruz).

[*Bolitoglossa*] *chiroptera* TAYLOR, Univ. Kansas Sci. Bull., vol. 26, No. 12, 1939 (1940f), pp. 410–411.

In all, 245 specimens, from the following localities: MÉXICO: Llano Grande, 5 miles west of Río Frío, August 21, 1939 (U.S.N.M. Nos. 116177–116188); Lake Zempoala, August 25, 1939, and July 28, 1940 (U.S.N.M. Nos. 116189–116196) (part from Morelos); Mount Popocatepetl, September 7 and October 8, 1939 (U.S.N.M. Nos. 116197–116211). PUEBLA: 2 miles east of Río Frío, México, August 21, 1939 (U.S.N.M. Nos. 116167–116176). VERACRUZ: Cruz Blanca, March 24, 1940 (U.S.N.M. No. 116212); 17 km. northeast of El Limón (Totalco), March 23, 1940 (U.S.N.M. Nos. 117372–117377); Toxtla-cuaya, March 24, 1940 (U.S.N.M. Nos. 117378–117379).

This species is found under clumps of dead grass, under and in rotten logs, and under loose bark. At Cruz Blanca they were once

obtained in considerable numbers in stump holes that had filled with pine needles and loose earth.

The distribution of this species is puzzling. It is known in the Ajusco range, Mount Popocatepetl, Mount Ixtaccihuatl, and the adjoining short range to the north. It is present, after a presumed hiatus, on the mountains of northeastern Puebla (north of Limón) and on Cofre de Perote. It appears to be absent on Mount Malinche (Malintsin). It has been taken on Mount Orizaba but not about the Cumbres de Acultzingo. It is apparently absent in the mountains to the north, in Hidalgo. Of course, its absence from the collections made in these localities is not conclusive evidence that it does not occur. However, where it is known to occur it is usually extremely common, and its habitat makes it especially easy to discover. In Hidalgo it is replaced by *B. multidentata*. We hold as surely incorrect the locality data "Tehuantepec" borne by U.S.N.M. No. 30347.

**BOLITOGLOSSA MULTIDENTATA (Taylor)**

*Oedipus multidentata* TAYLOR, Univ. Kansas Sci. Bull., vol. 25, No. 14, 1938 (July 10, 1939a), pp. 289–291, pl. 29, fig. 1 (Alvarez, San Luis Potosí).

*Bolitoglossa multidentata* TAYLOR, Univ. Kansas Sci. Bull., vol. 26, No. 12, 1939 (1940f), p. 407.

A large series of 108 specimens was collected in El Chico National Park, Hidalgo, on September 17, 1939, a part of which series bears U.S.N.M. Nos. 106324 to 106338. These were found under bark, under logs and rocks, as well as in bromelias growing on the trunks of the fir and pine trees. One female examined contains 11 large ovarian eggs, 5 on one side, 6 on the other.

In gravid females the adpressed limbs may merely touch or fail to touch by the width of a costal fold, while in males they usually overlap the width of a fold.

**BOLITOGLOSSA TERRESTRIS Taylor**

PLATE 20

*Bolitoglossa terrestris* TAYLOR, Univ. Kansas Sci. Bull., vol. 27, pt. 1, No. 7, Nov. 1, 1941d, pp. 115–117 (6 miles south of Tianguistengo, Hidalgo, México).

U.S.N.M. Nos. 116319 to 116321 from 5 to 6 miles north of Zacualtipán (August 10–11, 1938), and U.S.N.M. Nos. 116322 and 116323 from 4 to 10 miles south of Tianguistengo, Hidalgo (July 1–2, 1940), are paratypes. The figures show variation in markings.

**BOLITOGLOSSA DIMIDIATA Taylor**

*Bolitoglossa dimidiata* TAYLOR, Univ. Kansas Sci. Bull., vol. 26, No. 12, 1939 (Nov. 27, 1940f), pp. 408–411, figs. 1–2 (Guerrero, near Mineral del Monte, Hidalgo).

This diminutive species is represented by 14 specimens, U.S.N.M. Nos. 116213–116226, collected September 17, 1939. They are from

a point in the El Chico National Park probably less than 2 miles from the exact type locality, but at a somewhat higher elevation. They were found under piles of chips and under rotting leaves, usually in well-shaded places.

**BOLITOGLOSSA XOLOCALCAE** Taylor

*Bolitoglossa xolocalcae* TAYLOR, Univ. Kansas Sci. Bull., vol. 27, pt. 1, No. 8, 1941e (December), pp. 148-150, pls. 7, 9, figs. 7-8 (Cerro Ovando, Chiapas, México, 6,800 to 7,100 feet elevation).

The type series, U.S.N.M. No. 111371 (type) and U.S.N.M. Nos. 111372-111470 (paratypes), are in the collection, secured April 16-17, 1940.

A total of 345 specimens of *Bolitoglossa xolocalcae* was collected, all on Mount Ovando, Chiapas. Occurring on the same mountain is a second, larger salamander, *Bolitoglossa nigroflavescens*. Both forms were found exclusively in bromelias during the dry season (April 15, 1940). The smaller form, *B. xolocalcae*, ranged from about 5,400 feet to the summit (7,100 feet), the greatest concentration occurring at about 6,800 feet. Here they were exceedingly numerous, occurring in practically all bromelias. In one plant 34 were found. At 6,000 feet the two species occurred with about equal frequency, but *B. nigroflavescens* was not taken above 6,800 feet or below 5,700 feet. Only a few *B. xolocalcae* were found below 5,700 feet; a single specimen was taken as low as at 5,400 feet.

The distribution of these species is to some extent dependent upon the distribution of bromelias. Three general types of bromelias occur in the salamander area of Mount Ovando—a small, a medium-sized, and a large form. *B. nigroflavescens* was found almost exclusively in the largest bromelias, rarely in the medium-sized form, never in the small. *B. xolocalcae* occurred in the large and medium-sized bromelias, but only a single specimen came from the small species. Its preference, however, was marked for the medium-sized plant.

The distribution of the two larger plant species corresponds with that of the two salamanders. The small bromelia occurred from 3,500 feet to the peak, but was a smooth, soft-leaved species. While offering ample room, it held very little water, and perhaps for this reason it was not frequented by the salamanders.

**BOLITOGLOSSA NIGROFLAVESCENS** Taylor

*Bolitoglossa nigroflavescens* TAYLOR, Univ. Kansas Sci. Bull., vol. 27, pt. 1, No. 8, 1941e (December), pp. 150-152, pls. 8, 9, figs. 9-10 (Cerro Ovando, Chiapas).

The following numbers are cataloged: U.S.N.M. Nos. 111169 (type); 111153-111168, 111170-111192 (paratypes).

A total of 58 specimens was collected on April 16-17, 1940, all on Mount Ovando, Chiapas, between 5,700 feet and 6,800 feet elevation, a zone that corresponds to the distributional zone of a large bromelia. The vertical distribution of this species is discussed under *B. xolocalcae*.

## BOLITOGLOSSA PLATYDACTYLA (Cuvier)

*Sal.[amandra] platyductylus* CUVIER, in Gray, in Griffith's Cuvier's Animal Kingdom, vol. 9, 1831 (A synopsis of the species of the class Reptilia), p. 107 (in synonymy of *Salamandra variegata*) (type locality, México).

The collection contains 202 specimens, collected in eastern México from San Luis Potosí south to southern Veracruz. The following are cataloged: SAN LUIS POTOSÍ: U.S.N.M. Nos. 117380–117381, Huichihuayán, December 7, 1938, and December 12, 1939. HIDALGO: U.S.N.M. No. 117382, 5 km. south of Chapulhuacán, December 13, 1939. VERACRUZ: U.S.N.M. Nos. 116278–116286, Cuautlapan, December 20, 1939, January, February, and July 1940; U.S.N.M. Nos. 116287–116297, Potrero Viejo, December 13, 1938 to January 9, 1939; U.S.N.M. Nos. 116298–116307, Cerro Gordo, March 24, 1940; U.S.N.M. Nos. 116308–116311, Mata de Caña, 25 miles southeast of Jalapa, March 24, 1940; U.S.N.M. No. 116312, Tezonapa, January 11, 1939; U.S.N.M. No. 116313, Presidio, January 10, 1939; U.S.N.M. Nos. 116314–116318, San Juan de la Punta, December 28, 1938.

In the southern part of México and to some extent in Central America the species is replaced by *Bolitoglossa mexicana*.

The Hidalgo specimen was found under a stone on the ground in a small grassy meadow at an elevation of about 3,000 feet, probably at nearly the maximum elevation attained by the species in that area. All San Luis Potosí specimens were found in bromelias, at a much lower elevation (about 300 feet above sea level). For other comments on habitat see the discussion of *B. rufescens*.

## BOLITOGLOSSA MEXICANA Duméril and Bibron

## FIGURE 58

*Bolitoglossa mexicana* DUMÉRIL and BIBRON, *Erpétologie générale*, vol. 9, 1854, p. 93, atlas, pl. 104, fig. 1 (Dolores, Petén, Guatemala).

Seventy-four specimens were secured; the following are numbered in the Museum collection: U.S.N.M. No. 116070 from Piedras Negras, Guatemala, May 24, 1939; U.S.N.M. Nos. 116071–116098 from San Juanito (near Palenque), Chiapas, July 7 to 23, 1939. All were found in large arboreal bromelias.

Variation in color and pattern is considerable. The belly is nearly black in some specimens, dark brown in others, but in four it is light gray. Intermediate shades are present. In all specimens there are observable at least a few white flecks or short streaks on the ventral surfaces; in some the flecks are very few, in others they are numerous. The dorsal light color varies from orange to pale yellow; many specimens show some reddish tinge.

The sides of the body are black or dark brown, even in the lighter-bellied specimens. The dark lateral color terminates in the dorso-lateral region, on a line extending from the upper eyelid along the sides of the body above arm and hindleg onto tail. At this line the dorsal color begins, sharply defined from the lateral dark color. The

line is not straight but serrate or with narrow extensions toward the middorsal area.

In the simpler patterns, two dark stripes extend from the occipital region, where they are united posteriorly to the base of the tail, terminating there more or less abruptly. Between them is enclosed a median light stripe. In some cases the dark stripes are discontinu-

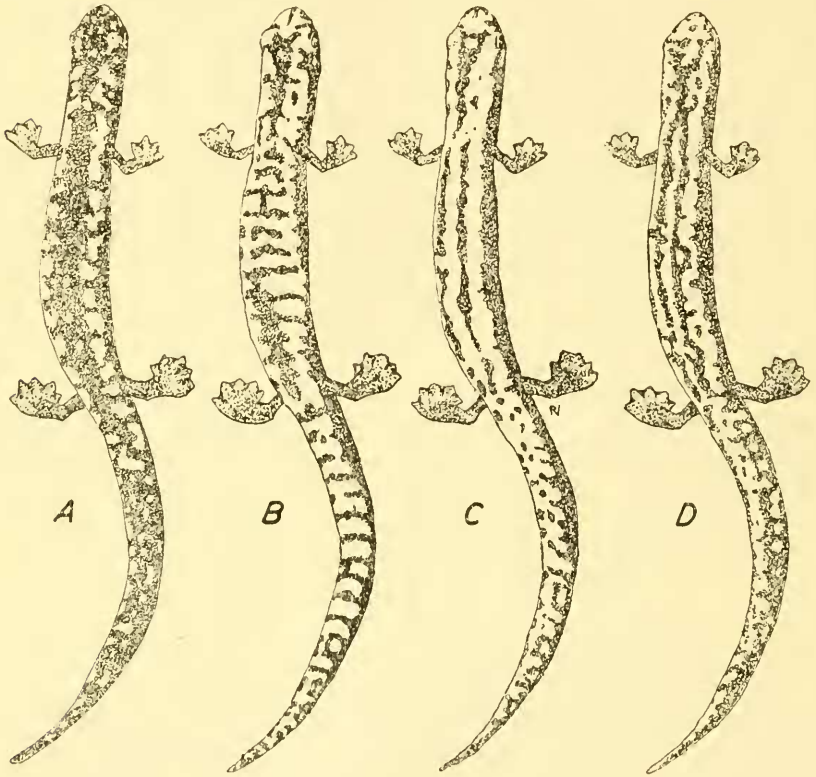


FIGURE 58.—*Bolitoglossa mexicana* Duméril and Bibron: *A*, U.S.N.M. No. 116077; *B*, U.S.N.M. No. 116074; *C*, U.S.N.M. No. 116079; *D*, U.S.N.M. No. 116082. All from near Palenque, Chiapas.

ous or enclose within them light spots sometimes arranged in a linear fashion.

A further type of variation is seen in those in which the two dark stripes are fused to form a single broad, median, dark stripe, which is modified either by being broken into irregular spots or by having extensions, along the costal grooves, which meet the dark lateral color.

Finally, certain specimens are simply cross-banded, the bars sometimes broken, sometimes fused medially or on each side in the position of the hypothetical two dark stripes.

A single specimen shows a pattern similar to that of the figure given by Duméril and Bibron (1854, pl. 104, fig. 1). On the lines of contact of dark and light color on the back, there is a fine white (or lighter) edge.

The dorsal surface of the tail may be nearly uniform light, with few dark spots, or strongly cross-barred, or heavily reticulated or even stippled with black, but is seldom lined.

**BOLITOGLOSSA FLAVIVENTRIS (Schmidt)**

*Oedipus flaviventris* SCHMIDT, Publ. Field Mus. Nat. Hist., zool. ser., vol. 20, 1936, pp. 148-150, fig. 17 (Chicharras, Chiapas).

Seventy-two specimens were collected from April 5 to June 3, 1940, at La Esperanza, Chiapas, of which U.S.N.M. Nos. 116367-116381 are cataloged.

All but two of this series were caught at night. One of the exceptions was a large female found deep in a rotten log. The specimen seemed to have been there some time, although it was in good condition, for it was somewhat stiff and moreover well caked with particles of rotten wood. Since the season was extremely dry (May), seven months having passed without rain, this example may have been estivating.

The other specimens had obviously been forced to the moist places during the dry season. They were found crawling about at night on the vegetation at the very edges of a small stream. They preferred the large-leaved plants of the genus *Calladium*, since they apparently hid in the axils of the leaves during the day, as evidenced by one specimen found in such a place. They were not disturbed by lantern light, and were easily picked up.

Of two females examined, one had 39 ovarian eggs, 17 on one side, 22 on the other; the second female, somewhat larger, had 58 eggs, 26 on one side, 32 on the other.

**BOLITOGLOSSA RUFESCENS (Cope)**

*Oedipus rufescens* COPE, Proc. Acad. Nat. Sci. Philadelphia, vol. 21, 1869a, p. 104 (Orizaba).

*Bolitoglossa rufescens* TAYLOR, Univ. Kansas Sci. Bull., vol. 27, pt. 1, No. 8, 1941e, p. 145.

A very large series, 1,449 specimens, of this species was obtained. The following have been cataloged in the collection of the U. S. National Museum: VERACRUZ: U.S.N.M. No. 117408, Mata de Caña, March 24, 1940; U.S.N.M. Nos. 116148-116166, Potrero Viejo, December 14, 1938 to January 9, 1939; U.S.N.M. Nos. 116137-116147, Cuautlapan, January 1-16, 1939, December 20, 1939, January, February and July 1940; U.S.N.M. Nos. 116132-116134, Peñuela, December 19, 1939; U.S.N.M. No. 116135, Presidio, January 10, 1939; and U.S.N.M. Nos. 116127-116131, Tezonapa, January 11-12, 1939. CHIAPAS: U.S.N.M. No. 117407, Palenque, July 6, 1939.

GUATEMALA: U.S.N.M. Nos. 117399-117406, Piedras Negras, Petén, June 24, 1939 to June 2, 1939.

By far the greatest number of these were found in banana trunks, seeking refuge in the axils of the thick, loose outer sheaths of the trunk. The red-trunked banana seems to be the only type that affords such protection. Other varieties for the most part have thin, dry sheaths, which adhere closely to the trunk and afford no protection for animals.

All the specimens from Piedras Negras, and the single one from Palenque, were found in bromelias. Although our observations are not extensive enough to warrant a definite statement, it appears that *B. rufescens* does not occur in the large, vase-shaped bromelias but is restricted to the large varieties having many leaves curving directly out from the base. Near Palenque we looked in many of the vase-shaped bromelias but found only *Bolitoglossa mexicana* in them; the few bromelias found of the other type contained no *B. mexicana* and but one *B. rufescens*. This seeming preference for the spread-leaf variety may depend more truly upon preference for more humid conditions, since that type of bromelia is generally confined to the vicinity of streams and to moist hillsides, while the urn-shaped variety is found on trees wherever they occur on the plains. The plains trees, furthermore, are almost entirely oaks, since these are the only ones which seem to resist the ravages of grass fires that burn unhindered during the dry seasons. Along the streams and on moist hillsides, other types of trees are predominant.

In the region of Potrero Viejo, Veracruz, the predominant large bromelia is the spread-leaf type, and in these we found *B. rufescens* almost exclusively, with rare examples of *Bolitoglossa platydactyla*. Potrero Viejo is situated, it may be remarked, in a very humid area. It is further noteworthy that this humidity does not restrict the abundance of *B. platydactyla*, even though specimens are rarely found in bromelias. They are very common in banana plants. Twenty or thirty miles to the east toward the coast a dry plains region is encountered. Trees are low and scattered, or occur in small groups. Here the vase-shaped bromelia is predominant, and in them we have never found *B. rufescens*, although *B. platydactyla* is abundant. In this region also the edges of streams and hillsides are more heavily wooded, and in such places the spread-leaf bromelia occurs. Very likely these harbor *B. rufescens*, but unfortunately we did not search in many of these plants, since this labor was very poorly repaid in general quality and quantity of specimens, at least compared with the results of work on the urn-shaped variety.

From our observations it is accordingly impossible to state whether humidity is the controlling factor in the apparent restriction of *B. rufescens* to the spread-leaf bromelia, or whether the construction of



the bromelia itself is the important factor. It is quite obvious why *B. platydactyla*, since it is large, does not occur in the spread-leaf bromelias, the leaves of which are so closely placed and narrow that the protection afforded is inadequate. But why *B. rufescens* does not occur in the urn-shaped bromelias, which certainly hold sufficient water, is not so apparent. A possibility is that its thigmotropic sense is involved. Both *B. platydactyla* and *B. rufescens* are positively thigmotropic, as shown by their abundance in banana sheaths. This sense is satisfied for *B. platydactyla* in the urn-shaped bromelia, but perhaps not so satisfactorily for *B. rufescens*. It would be submerged in water if it crawled toward the base far enough to be wedged between the sides of adjacent leaves, while its situation would be precarious if it remained elsewhere, for the leaves are not closely approximated, except toward the top and at the base.

A group of about 30 eggs taken in a bromelia at a point 3 miles north of Huichihuayán, San Luis Potosí, December 12, 1939, contains embryos which are certainly of this or a very closely related species. No adults of this species have been obtained so far north.

#### BOLITOGLOSSA OCCIDENTALIS Taylor

*Bolitoglossa occidentalis* TAYLOR, Univ. Kansas Sci. Bull., vol. 27, pt. 1, No. 8, Nov. 1, 1941e (Dec.), pp. 145-147, fig. 1c, pl. 9, figs. 1, 2 (La Esperanza, Chiapas).

This form is represented by 33 specimens, including the type, U.S.N.M. No. 111085, from La Esperanza, Chiapas, April 7, 1940, to May 13, 1940; and paratypes, U.S.N.M. Nos. 111068-111084, 111086-111093, topotypes.

This species, with a toothed maxilla, appears to be confined to the Pacific drainage at relatively low elevations. On the Atlantic drainage it appears to be replaced by *B. rufescens*, a form with the maxillary teeth lacking.

All the specimens from La Esperanza were captured at night, crawling on the grass or on *Calladium* leaves at the edge of a small stream. One from Finca Juárez was found crawling along the retaining wall of an irrigation ditch at night.

#### BOLITOGLOSSA TOWNSENDI (Dunn)

*Oedipus townsendi* DUNN (part), Proc. Biol. Soc. Washington, vol. 35, 1922, p. 5 (Cerro de los Estropajos, near Jalapa, Veracruz) (the type series includes a specimen [M. C. Z. No. 8018] of *B. dimidiata*).

*Bolitoglossa townsendi* TAYLOR, Univ. Kansas Sci. Bull., vol. 27, 1941d, p. 107.

Three specimens, U.S.N.M. Nos. 111013-111015, as well as an unnumbered lot containing 10 very young specimens that we believe are of this species, are in the collection from Cuautlapan, Veracruz, secured in July 1940.

Genus **OEDIPINA** Keferstein, 1868**OEDIPINA LINEOLA** (Cope)

*Spelerpes lineolus* COPE, Proc. Acad. Nat. Sci. Philadelphia, vol. 17, 1865a, p. 197 ("Mexican Tableland").

*Oedipina lineola* COPE, U. S. Nat. Mus. Bull. 32, 1887, p. 8.

A series of 84 specimens was collected. The following are cataloged in the National Museum collection: VERACRUZ: U.S.N.M. Nos. 116387-116396 from Cuautlapan (January, February, and July, 1940), and U.S.N.M. No. 116397 from Metlac, February 9, 1939.

These were found under stones, logs, and in chip piles, in moist situations on hillsides at an elevation of about 2,500 feet.

The locality data "Tehuantepec," borne by U.S.N.M. No. 30353, we regard as highly improbable.

Tails of this form continue growth at least during a considerable part of the life of the animal. The number of caudal vertebrae may reach 60 in very large specimens, while in the half-grown 35 or 40 only may be present.

The type locality suggests that this form is from the plateau, but it is far more probable that the type came from the eastern slope of the plateau at an elevation probably not above 3,500 feet. A specimen at Harvard (M.C.Z. No. 8381) is said to be from Jalapa, which has an elevation of 4,200 feet.

Order **SALIENTIA** Laurenti, 1768Family **RHINOPHRYNIDAE** Günther, 1858Genus **RHINOPHRYNUS** Duméril and Bibron, 1841**RHINOPHRYNUS DORSALIS** Duméril and Bibron

## PLATE 21, FIGURE 2

*Rhinophrynus dorsalis* DUMÉRIL and BIBRON, *Erpétologie générale*, vol. 8, 1841, p. 758, pl. 91, figs. 2, 2a (Veracruz, Veracruz).

Ninety-seven specimens were collected, of which the following are catalogued: CHIAPAS: La Esperanza, May 25, 1940, U.S.N.M. No. 114039; Cruz de Piedra, May 10-11, 1940, U.S.N.M. Nos. 114013-114037; Colonia Soconusco, May 9, 1940, U.S.N.M. No. 114038. OAXACA: Tehuantepec, January 8-11 and March, 1940, U.S.N.M. Nos. 114041-114043. VERACRUZ: Potrero Viejo, June 8, 1939, U.S.N.M. No. 114040.

Most of the specimens were measured, but all bore the characters of *dorsalis*; none of them were of the *rostratus* type, described by Brocchi from Tehuantepec, as having a much longer snout, the eyes closer together, and the nostril midway between eyes and the tip of the snout.

There are, however, remarkable differences in the appearance of the tongue in various specimens. In one, at least, it fills the cavity of the mouth, while in others it appears to be reduced to an organ only a fourth or a fifth of the size of that mentioned. This species has the tongue free anteriorly.

### Family PELOBATIDAE Lataste, 1879

#### Genus SCAPHIOPUS Holbrook, 1836

##### SCAPHIOPUS COUCHII Baird

*Scaphiopus couchii* BAIRD, Proc. Acad. Nat. Sci. Philadelphia, vol. 7, 1854, p. 62 (Río Nazas, Coahuila, and Matamoros, Tamaulipas).

Eighteen specimens are from the following localities: CHIHUAHUA: 1 mile south of Ahumada, October 9, 1938 (U.S.N.M. No. 105176); Río Santa María, near Progreso, October 12–14, 1938 (U.S.N.M. Nos. 105162–105175). TAMAULIPAS: Hacienda La Clementina, 4 miles west of Forlón, November 22, 1938 (U.S.N.M. Nos. 105251–106253).

##### SCAPHIOPUS MULTIPLICATUS Cope

*Scaphiopus multiplicatus* COPE, Proc. Acad. Nat. Sci. Philadelphia, vol. 15, 1863, p. 52 (Valley of Mexico).

Nine specimens were picked up as they hopped along the road at night during a shower, about 13 km. north of Venta del Carpio, México, May 1, 1939 (U.S.N.M. Nos. 114044–114052). These specimens may be regarded as topotypic, since the type locality is not specific, but includes the locality mentioned, which lies about 30 km. north of México (City).

### Family BUFONIDAE Hogg, 1841

#### Genus BUFO Laurenti, 1768

##### BUFO HORRIBILIS Wiegmann

*Bufo horribilis* WIEGMANN, Isis von Oken, vol. 26, pt. 7, 1833, pp. 654–655 (vicinity of Veracruz, México).

*Bufo marinus* KELLOGG, U. S. Nat. Mus. Bull. 160, 1932, pp. 53–57, fig. 11.

We are quite convinced that *Bufo marinus* Linnaeus, as generally accepted, comprises species or/and subspecies and is in fact of almost generic significance. However, certain difficulties are involved in properly delineating and naming these forms. In the first place the type localities of *Bufo marinus* and *B. aqua* are unknown except that they are from the Western Hemisphere. *Bufo maculiventris* and *B. lazarus* of Spix are Brazilian, but lack exact localities; *B. ictericus* Spix, however, is cited with Rio de Janeiro as type locality. *B. humeralis* Daudin "existe dans diverses contrées meridional du nouveau continent." He mentions one in the Muséum d'Histoire Naturelle

from Cayenne (French Guiana). This may be presumed to be the type locality for this species.

A second difficulty is that seldom are good series of these great toads collected; and the age, sex, and environmental variations are known for only a few localities.

Wiegmann described *Bufo horribilis* from a series of cotypes from the state of Veracruz, and we are reviving this designation for most of the toads of this group in México aware that there are probably variant populations even here, that may warrant subspecific designations.

A total of 27 specimens was collected, of which the following are cataloged: MICHOCÁN: U.S.N.M. No. 116512, 4 km. north of Apatzingán, March 18, 1939. MORELOS: U.S.N.M. No. 116517, Puente de Ixtla, April 25, 1940. OAXACA: U.S.N.M. Nos. 116536-116537, Tehuantepec, January 1, 1940. TABASCO: U.S.N.M. No. 116523, Tenosique, June 30, 1939. CHIAPAS: U.S.N.M. Nos. 116514-116516, Cruz de Piedra, April 25, 1940; U.S.N.M. Nos. 116518-116522, San Juanito, July 7-19, 1939. GUATEMALA: U.S.N.M. Nos. 116524-116535, Piedras Negras, May 21 to June 22, 1939.

It is possible that more than a single race of this toad is represented, although some of the differences are probably due to age and sex. The most significant differences are in U.S.N.M. No. 116514, a half-grown (110 mm.) specimen from Cruz de Piedra, near Acacoyagua, Chiapas. In this the cranial crests are very low (or perhaps the interorbital region is elevated to near the level of the crest). The interorbital and postorbital crests form continuous curves. No occipital crest; the profile of the snout is curving to the top of head, and is not truncate; the parotoid glands are rather small, and colored like the body. The specimen is a male and the skin is very rough; two other specimens from this locality are juveniles. However, specimens in the E. H. Taylor-H. M. Smith collection from Chiapas show these same unusual head structures.

The Michoacán specimen is very large (139 mm. snout to vent). The rusty-brown parotoid glands are extremely large, triangular, the apex pointing backward. Their greatest length is 48 mm., their width, measured on the curve, 44 mm. The specimen is a male, and the skin is very rough. The snout is sharply truncate, the ridges high and covered with black horn. The interorbital crests are rather angular, and an occipital crest is indicated.

It is of interest to record here four specimens added to the National Museum collections since the publication of Kellogg's summary (1932, p. 57): U.S.N.M. No. 84398, Veraacruz, Veracruz; U.S.N.M. No. 84414, Motzorongo, Veracruz; U.S.N.M. No. 84416, Tetecala, Morelos; and U.S.N.M. No. 84418, "Chiapas."

## BUFO ANGUSTIPES, new species

## FIGURE 59

*Type*.—U.S.N.M. No. 116513, female, collected at La Esperanza, Chiapas, April 7, 1940, by Dr. and Mrs. Hobart M. Smith.

*Diagnosis*.—A large toad of the *Bufo marinus* group, characterized by having slender limbs; the tibiotarsal articulation reaching the tympanum; the foot elongate, slender; tubercles on body low, indistinct, belly nearly smooth except for indistinct, smooth-surfaced granules; tarsal fold present; tympanum large, subcircular, not encroached upon by the parotoid. Area surrounding tympanum entirely smooth; diameter of tympanum four-fifths of eye; parotoid roughly triangular, moderately large, reddish (see fig.).

*Description of type*.—Head broad, its width (49 mm.) greater than its length (38 mm. to posterior end of jaw). The longitudinal diameter of the orbit, measured on inner edge of the crests, 16.8 mm.; diameter of eye 11 mm.; diameter of tympanum 8 mm.; length of snout 12 mm.; width of an eyelid (9 mm.) twice in interorbital distance; snout truncate; choanae large, the palatal glands opening by two outlets near the inner edge of choanae; palatine with dentate rugosities; tongue narrow, elongate, subquadrangular.

Parotoid smooth, moderate, its length (34 mm.) slightly less than length of head; its width measured on the curve, 32 mm.; skin over body smooth, with a few smooth tubercles; hindlimbs with low, indistinct, smooth tubercles; ventral surfaces smooth, with slight indication of fine granulation in posterior abdominal region.

Limbs slender; digits likewise slender; first finger longer than second; second slightly shorter than fourth; inner palmar tubercle moderate, outer (medial) very large, nearly as wide as long; outer tubercle on third finger not distinctly bifid; toes about one-third webbed, the subarticular tubercles indistinct; inner metatarsal tubercle small, flat; outer small, rather indistinct.

*Measurements*.—For purposes of comparison, after the measurements (in mm.) of the type of *B. angustipes* we give those for a specimen of comparable size of *B. horribilis* from Chiapas (E.H.T.-H.M.S. No. 3880). Both specimens are females. Snout to vent, 127, 133; width of head, 47, 45; length of head, 31, 33; width between supratympanic crests, 43, 40; length of bony orbit (inside crests), 18, 15.5; height of tympanum, 7, 8; length of same, 5.5, 6.5; length of parotoid, 34, 38; arm, 76, 68; leg, 162, 147; femur, 50, 47; foot, 79, 67; elevation of snout at front of eye, 13.5, 15.8.

*Remarks*.—That this is a very different form from *Bufo horribilis* of Veracruz, or the variety occurring in Chiapas, is evident. It likewise differs from more southern "*Bufo marinus*." We suspect it to be a much smaller species than either *horribilis* or "*marinus*."

A single young specimen of this species, from Chiapas, was discovered in the E.H.T.-H.M.S. collection but was inadvertently lost

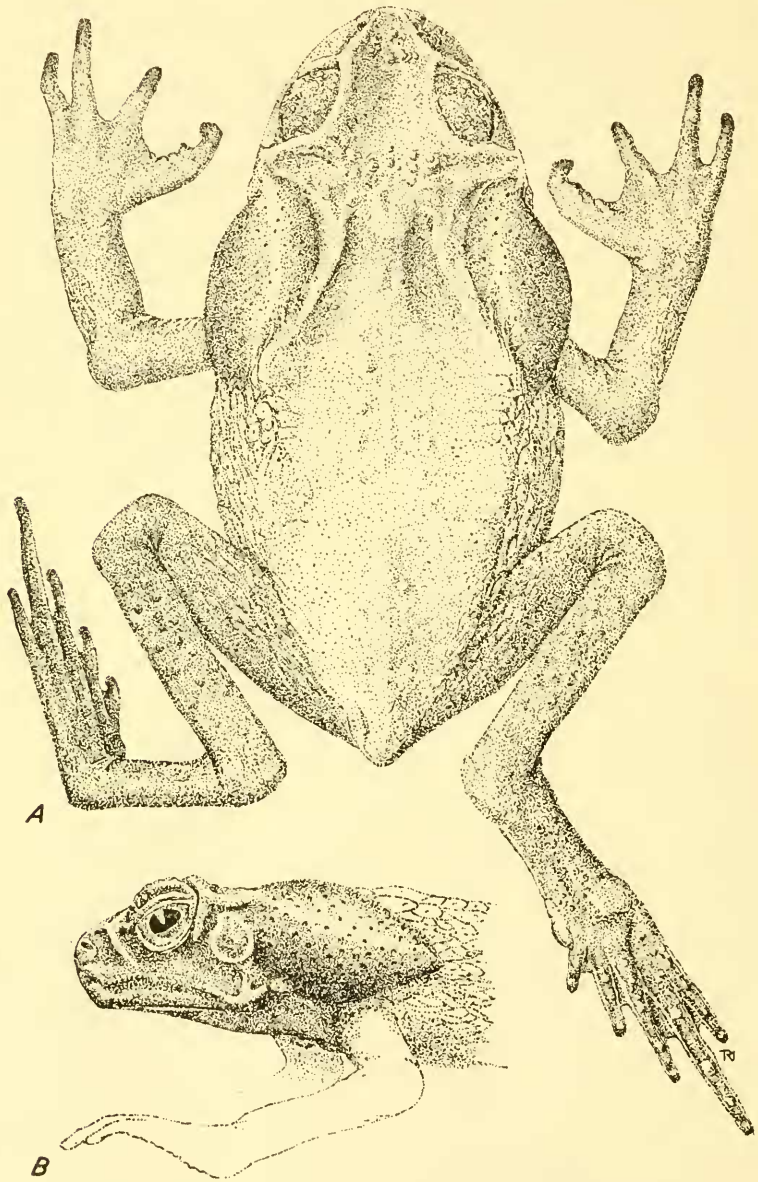


FIGURE 59.—*Bufo angustipes*, new species: Type, U.S.N.M. No. 116513, female, La Esperanza, Chiapas; snout to vent length, 127 mm. A, Dorsal view; B, side of head.

when being taken to be photographed. The specific differences were marked. Even the head was distinctly larger than that of the young

of the Chiapas form of *horribilis*; and the large tympanum with elevated border was evident.

The type was found at night walking (not hopping) about on the ground deep in a newly cut cafetal. No other specimens of this group were seen under similar conditions, although in more open areas, as around human habitations and in cleared fields, they (*horribilis*) were common.

**BUFO PERPLEXUS** Taylor

*Bufo perplexus* TAYLOR, Univ. Kansas Sci. Bull., vol. 29, 1943b, pp. 347-349, pl. 27, figs. 1, 2 (Balsas River near Mexcala, Guerrero).

The following specimens in the collection are paratypes: U.S.N.M. No. 116564, Puente de Ixtla, Morelos, September 5, 1939; U.S.N.M. Nos. 116565-116568, Tehuantepec, Oaxaca, May, 1940.

In this form there is a strong color pattern dimorphism between the sexes. The species is smaller than *B. marmoreus*, with which it is sometimes confused. Its distribution as known at present is Morelos, Guerrero (northern and central parts), Oaxaca, and Chiapas—all on the Pacific drainage.

**BUFO PUNCTATUS** Baird and Girard

*Bufo punctatus* BAIRD and GIRARD, Proc. Acad. Nat. Sci. Philadelphia, vol. 6, 1852, p. 173 (Río San Pedro, tributary of the Río Grande del Norte, Texas).

The following specimens, 13 in number, are in the collection: U.S.N.M. No. 106144, 31 miles south of Chihuahua, Chihuahua, October 26, 1938; U.S.N.M. No. 115487, Sabinas Hidalgo, Nuevo León, April 29, 1939; and U.S.N.M. Nos. 115488-115498, 15 miles west of Galeana, Nuevo León, October 13-14, 1939.

All the specimens show black punctations on chin, breast, and anterior part of abdomen. They usually lack the reddish spots present in western American specimens. The single male has the vocal slit sinistral.

**BUFO MARMOREUS** Wiegmann

PLATE 23, FIGS. 1, 2

*Bufo marmoreus* WIEGMANN, Isis von Oken, vol. 26, pt. 7, 1833, p. 661 (Veracruz, México).

The collection contains five specimens. Four young individuals are from Guerrero, México: U.S.N.M. Nos. 116560-116561, Tierra Colorada, August 31, 1939; and U.S.N.M. Nos. 116562-116563, Acapulco, September 3, 1939. These are females having the typical coloration. A single specimen, U.S.N.M. No. 116569, is from Escurana, Oaxaca (15 km. west of Tehuantepec), May, 1940.

The sexual dimorphism in this species is especially great. In a series we have examined, in the E.H.T.-H.M.S. collection, we find that the females have a median, rather broad dorsal stripe, with a

series of paired dark spots (often with lighter edges) more or less symmetrically arranged along the back. The spots of the first pair cross the upper eyelid and are closely approximated in the interorbital region, but rarely meet to break the continuity of the median light stripe or line. The other dark spots are variable in size, there being, usually, three pairs on the back. The anterior of these is largest and posterior ones vary in distinctness and size. There is usually a more or less distinct, broad, irregular stripe on the side running somewhat diagonally, while bordering this below or laterally, the side is variously marbled or mottled.

Males, on the other hand, are more or less uniform gray-green or gray-olive on the head and back. The limbs are very strongly striped with light and dark (which in the females is usually not so pronounced). In consequence of the uniform background the pustules of the back stand out strongly. These bear dark brown tubercles or spines. The latter are confined to the back, while the pustules on the sides are as smooth as those of the female. The sides are usually mottled with dark and lighter markings, the dark sometimes almost black, as are the dark stripes on the limbs on occasion.

This form in the past has been confused with the recently described *Bufo perplexus* Taylor.

**BUFO WOODHOUSHI WOODHOUSHI Girard**

*Bufo woodhousii* GIRARD, Proc. Acad. Nat. Sci. Philadelphia, vol. 7, 1854, p. 86 ("New Mexico" = San Francisco Mountain, Coconino County, Ariz.).

*Bufo woodhousii woodhousii* SMITH, Amer. Midl. Nat., vol. 15, 1934, pp. 449-457, pls. 17, 22B, 23B.

Two young specimens (U.S.N.M. Nos. 105158) are from Río Santa María, Chihuahua, October 13, 1938.

**BUFO COMPACTILIS Wiegmann**

*Bufo compactilis* WIEGMANN, Isis von Oken, vol. 26, pt. 7, 1833, pp. 661-662 (México [probably from the region about México (City)]).

The following localities are represented, by seven specimens: U.S.N.M. No. 116416, Mamulique Pass, Nuevo León, April 29, 1939; U.S.N.M. Nos. 116417-116419, La Palma, Michoacán, March 23, 1939; U.S.N.M. Nos. 116413-116414, 40 km. north of México (City), in the state of México, May 1, 1939; and U.S.N.M. No. 116415, Santa Magdalena, near Texcoco, México, August 23, 1939.

The northern specimen is young and cannot be compared well with the southern specimens. The three from Michoacán have the pustules and intervening skin somewhat less rough than those from the environs of México (city). In the largest of these latter specimens, U.S.N.M. No. 116413 (female, 78 mm.), the crests are distinct and provided with spots of horn along their surface. In most of the other specimens the crests are indistinct or not discernible.



Since Kellogg's list (1932, pp. 44-48) appeared, one other specimen of interest has been added to the National Museum's collection, from San Juanito, Chihuahua (U.S.N.M. No. 95603).

BUFO CANALIFERUS Cope

PLATE 21, FIGURE 1

*Bufo canaliferus* COPE, Proc. Amer. Philos. Soc., vol. 17, No. 100, July 20, 1877, p. 85 (Tehuantepec, Oaxaca, México).

A large series, 129 specimens, of this species was obtained in the state of Chiapas; the following are cataloged: U.S.N.M. Nos. 115983-115992, Cruz de Piedra, April 21 to May 11, 1940; U.S.N.M. Nos. 115993-116002, Colonia Soconusco, April 14 and May 9, 1940; U.S.N.M. Nos. 116003-116022, La Esperanza, April 14 to June 3, 1940; U.S.N.M. No. 116923, Rancho Las Gradass, 3 km. northeast of La Esperanza, May 20, 1940; and U.S.N.M. No. 116924, Tonalá, Chiapas, January 26-30, 1940.

This small species seems to be confined to the southern part of México (for the most part south and east of the Isthmus of Tehuantepec) and northern Central America (Guatemala). We regard the Orizaba, Veracruz, record given by Kellogg (1932, p. 40) as doubtful.

The more obvious pattern variations do not seem sex-linked. Usually large dark spots are present on each side of the middorsal line, but some specimens have the dorsal surfaces unspotted and nearly uniform saffron-yellow. The largest male is 44 mm. Eight males have the vocal slit sinistral, six dextral. The largest female is 55 mm. snout to vent.

In Chiapas the species is extremely common during the rainy season. It occurs in dense forest as well as on open plains.

Five young specimens from Tapaná, Oaxaca (U.S.N.M. No. 10036), referred by Kellogg (1932, p. 41) to this species, actually are *marmoratus*.

BUFO SIMUS Schmidt

*Bufo simus* SCHMIDT, Denkschr. Akad. Wiss. math.-naturw. Classe Wien, vol. 14, 1858, pt. 2, pp. 254-255, pl. 3, fig. 22 (Chiriquí River, in the vicinity of Bocas del Toro, Panamá).

Of seven specimens, six (U.S.N.M. Nos. 116538-116543) are from Tecamachalco, September 16, 1939, and one (U.S.N.M. No. 116544) from San Diego, Puebla, December 17, 1939.

Two of the males have the vocal slit dextral; two have them present on both sides. In four of the specimens the skin, while pustulous, is very soft and smooth to the touch. Of these, two are males, two females; two others of the series from the same locality are rough with horny spines on the pustules. The tympanum is distinct but varies somewhat; in some it is more elongate oval than in others.

Added to the National Museum since the appearance of Kellogg's list (1932) are U.S.N.M. No. 63868 from "Colima" and U.S.N.M. Nos. 84399-84402 from Oaxaca, Oaxaca.

**BUFO INSIDIOR Girard**

*Bufo insidiosus* GIRARD, Proc. Acad. Nat. Sci. Philadelphia, vol. 7, 1854, p. 88 (Chihuahua, México).

A large series (55 specimens) of this common species was obtained in Chihuahua: U.S.N.M. Nos. 105102-105108, 1 mile south of Villa Ahumada, October 9, 1938; and U.S.N.M. Nos. 105109-105156, Río Santa María, near Progreso, October 13, 1938

Of 14 males examined the vocal slit is sinistral in four, dextral in nine, and both sinistral and dextral in one specimen.

Rugosities ("teeth") are present on the palatine bone, appearing above the gum in adult specimens.

**BUFO COCCIFER Cope**

PLATE 22

*Bufo coccifer* COPE, Proc. Acad. Nat. Sci. Philadelphia, vol. 18, 1866b, p. 130 (Arriba, Costa Rica).

Five specimens, U.S.N.M. Nos. 115482-115486, were secured at Agua del Obispo (Kilometer 351), Guerrero. Some were calling at night (August 31, 1939), and others were taken from under stones in the daytime.

One is a female, four are males. The latter show dim spotting on the venter, and there is a transverse dark area on the neck. The vocal slit is sinistral in three males, dextral in one. The female measures 62 mm., the largest male 57 mm., from snout to vent.

**BUFO COGNATUS Say**

*Bufo cognatus* SAY, in James, Account of an expedition from Pittsburgh to the Rocky Mountains, vol. 2, 1823, p. 190 (Arkansas River, Prowers County, Colo.).

In all, 127 specimens, from the following localities: CHIHUAHUA: Río Santa María near Progreso, October 13-14, 1938 (U.S.N.M. Nos. 105056-105081); 1 mile south of Villa Ahumada, October 9, 1938 (U.S.N.M. Nos. 105082-105101); 3 miles east of Carmen, October 22, 1938 (U.S.N.M. No. 106143). COAHUILA: 13 miles west of San Pedro, November 5-9, 1938 (U.S.N.M. Nos. 106164-106226). DURANGO: 10 miles south of Escalón, Chihuahua, November 29, 1938 (U.S.N.M. No. 106145); 10 miles north of Gómez Palacio, October 29, 1938 (U.S.N.M. No. 106146-106161).

## BUFO CRISTATUS Wiegmann

## PLATE 23, FIGURES 5, 6

*Bufo cristatus* WIEGMANN, Isis von Oken, vol. 26, pt. 7, 1833, pp. 660-661 (Jalapa, Veracruz).

The following specimens, 30 in number, were collected: VERACRUZ: Cuautlapan, January 1-16 and September 25, 1938, and January to February, 1940 (U.S.N.M. Nos. 116545-116558); San José de Gracia September 26, 1940 (U.S.N.M. No. 116559); Potrero Viejo, December 13, 1938 and June 17, 1939 (U.S.N.M. Nos. 116990-116992). CHIAPAS: Cruz de Piedra, April 25 to May 15, 1940 (U.S.N.M. Nos. 116994-117003); Salto de Agua, May 19, 1940 (U.S.N.M. No. 117004); Colonia Soconusco, May 23, 1940 (U.S.N.M. No. 117005).

The species is not at all rare in the region about Cuautlapan. Specimens were taken (August 19) in the village street and in a pool a few hundred yards south of town and at an elevation about 300 feet higher. *Bufo horribilis*, *Bufo valliceps*, *Agalychnis moreletii*, *Hyla rickardsi*, *Hyla staufferi*, *Hyla baudinii*, *Hylella picta*, and *Microhyla usta* were taken in the same pool (Taylor). Claspings pairs of *cristatus* were taken but no eggs were found.

The color of the males is variable above, some dark olive to greenish yellow with dark markings, occasionally reddish brown; parotoids the same color as the body; chin yellowish with a bluish or blackish area on the vocal sac; venter dirty flesh to white, with olive reticulations on the breast and anterior part of abdomen; occasionally a wash of yellow over the ventral surfaces; upper lip cream.

Females often show indefinite patterns above with dark spots along the sides of the median line. Two are very dark above so that the dark spots are seen with difficulty.

The young are of two types; one very dark above, with the chin, throat, and abdomen also dark. The underside of the thigh is lighter flesh. The ventral tubercles are tipped with yellow, and there are a few tiny yellow spots on the back part of the abdomen. The others are lighter, uniform or variegated brown, light gray or brownish gray. An interorbital bar and a few more or less symmetrically placed spots of dark (the largest usually on the rump) are present. These are usually yellow below, with dark reticulation.

The two largest specimens measure 90 mm. from snout to vent. One is light variegated brownish olive above, the other is nearly black. Both are females.

## BUFO VALLICEPS Wiegmann

## PLATE 24, FIGURES 1-6

*Bufo valliceps* WIEGMANN, Isis von Oken, vol. 26, pt. 7, 1833, pp. 657-659 (México).

Eighty-four specimens were secured; the following are cataloged in the Museum collection: CHIAPAS: U.S.N.M. Nos. 116960-116965,

116972, San Juanito, near Palenque, July 7-23, 1939; U.S.N.M. Nos. 116967-116971, ruins of Palenque, near Palenque, July 10, 1939. TABASCO: U.S.N.M. No. 116986, Tenosique, June 30, 1939; U.S.N.M. Nos. 116987-116989, Santo Tomás. HIDALGO: U.S.N.M. Nos. 116984-116985, 6 km. south of Santa Anita, October 10, 1939. TAM-AULIPAS: U.S.N.M. No. 106254, Hacienda La Clementina, 4 miles west of Forlón, November 22, 1938; U.S.N.M. No. 106255, Villagrán, December 17, 1938. GUATEMALA: U.S.N.M. Nos. 116981-116982, Pozo de la Jicotea, 5 miles south of Piedras Negras, June 3, 1939; U.S.N.M. Nos. 116973-116980, 116983, Piedras Negras, May 21 to June 2, 1939.

The series from the northern part of the range differs rather considerably from those in the southern part of the range. One of those from Hidalgo (northern) is by far the largest specimen, having a snout-to-vent length of 100 mm. It likewise is from an elevation probably higher than any other specimen (4,500 feet). The fringe on the toes is greater than obtains in the southern specimens (Tabasco, Campeche, Guatemala, etc.), and the outline of the anterior part of the head is distinctly rounded.

Of the southern specimens the largest measured 80 mm. In these there is less dorsal marking, many of the specimens being largely amber or clay-colored above, with slight interorbital dark spots or a narrow bar and with a few dark flecks on back somewhat symmetrically arranged; the bars on the legs are dim.

The series from the Palenque ruins is composed entirely of young, 20.5 mm. to 27.5 mm. in length; all have the skin of the venter smoother and with much more dark pigment than occurs in other specimens.

When the young of a northern specimen is compared with the southern there are noticeable differences in the character of tubercles, especially the dorsolateral row, in the shape of the snout, the elevation, and size of the tympanum. The crests appear at an earlier age (smaller size) in southern specimens.

Though this southern form is probably separable from the northern, the matter cannot be decided now. Moreover, granted that it is separable, the types would need to be examined to ascertain whether the name *valliceps* should apply to the northern or southern form. If to the latter the name *nebulifer* Girard would be available for the northern form.

Acquisitions to the National Museum since Kellogg's list appeared (1932, p. 71) include No. 83394, Matamoros, Tamaulipas; No. 84418, Motzorongo, Veracruz; and No. 84417, Puebla, Puebla (probably an erroneous locality as the species is unknown on the high plateau). Since *valliceps* does not occur north of the Isthmus of Tehuantepec on Pacific

slopes, we suggest that U.S.N.M. Nos. 46948–46949 from Acapopetla, Nayarit, belong to the recently described *Bufo mazatlanensis* Taylor (1940g, pp. 492–492, pl. 53, fig. 1, pl. 54).

### Family LEPTODACTYLIDAE Berg, 1896

#### Genus ENGYSTOMOPS Jiménez de la Espada, 1872

##### ENGYSTOMOPS PUSTULOSUS (Cope)

*Paludicola pustulosa* COPE, Proc. Acad. Nat. Sci. Philadelphia, vol. 16, Aug. 1864, p. 180 (New Granada on the River Truando, Colombia).

*Engystomops pustulosus* BOULENGER, Catalogue of the Batrachia Salientia s. Ecaudata in the collection of the British Museum, ed. 2, 1882, p. 275.

Seven specimens of this diminutive toadlike species were acquired, U.S.N.M. Nos. 116482 and 116483 at Tenosique, Tabasco, June 30, 1939; U.S.N.M. No. 116486 at Potrero Viejo, Veracruz, July 3, 1939; U.S.N.M. Nos. 116484, and 116486–7 at Tehuantepec, Oaxaca, January 6 and March, 1940; and U.S.N.M. No. 116485 at Tonalá, Chiapas, January 26–30, 1940.

Specimens we have examined from the more northern localities about Potrero and to the east of Jalapa (E.H.T.–H.M.S. collection) are a little smaller on the average, but this is due to the larger number of males. There are apparently no constant differences worthy of nomenclatorial recognition in the various Mexican specimens. We have not examined a series from the type locality and it may well be that the Mexican form is not identical with that from Colombia.

#### Genus LEPTODACTYLUS Fitzinger, 1826

##### LEPTODACTYLUS MELANONOTUS (Hallowell)

*Cystignathus melanonotus* HALLOWELL, Proc. Acad. Nat. Sci. Philadelphia, vol. 12, 1860, p. 485 (Nicaragua).

*Leptodactylus melanonotus* BROCCHI, Mission scientifique au Mexique et dans l'Amérique centrale, Batrachia, 1881, p. 20.

In all, 317 specimens were collected, from the following localities: CHIAPAS: Various localities in the vicinity of La Esperanza (Acacoyagua, Colonia Hidalgo, Colonia Soconusco, Cruz de Piedra, Rancho las Gradadas) and La Esperanza, April 14 to May 23, 1940 (U.S.N.M. Nos. 114326–114337; 114345–114390); Tonalá, January 26–30, 1940 (U.S.N.M. Nos. 114338–114344). GUERRERO: 5 km. north of Acapulco, February 9–10, 1939 (U.S.N.M. Nos. 114235–114239); Tierra Colorada, February 12–13, 1939, and August 31, 1939 (U.S.N.M. Nos. 114240–114245); 8 km. east of Coyuca, February 7, 1939 (U.S.N.M. Nos. 114232–114234). MICHOACÁN: 4 km. north of Apatzingán, March 14–18, 1939 (U.S.N.M. Nos. 114246–114263). OAXACA: Various localities in the vicinity of Tehuantepec (Cerro Arenal, Cerro Guengola, Cerro de Huamelula) and Tehuantepec, January 2–May,

1940 (U.S.N.M. Nos. 114272-114325). TABASCO: Tenosique, June 30 to August 25, 1939 (U.S.N.M. Nos. 114264-114271). GUATEMALA: Pozo de la Jicotea, near Piedras Negras, June 3, 1939 (U.S.N.M. No. 114391).

**LEPTODACTYLUS LABIALIS (Cope)**

*Cystignathus labialis* COPE, Proc. Amer. Philos. Soc., vol. 17, 1877, p. 90 (México).  
*Leptodactylus labialis* BROCCHI, Mission scientifique au Mexique et dans l'Amérique centrale, Batrachia, 1881, p. 20, pl. 5, fig. 1.

Twenty-two specimens are from the following localities: CHIAPAS: Palenque, July 10-23, 1939 (U.S.N.M. Nos. 114219-114224); vicinity of La Esperanza, April 25 to June 4, 1940 (U.S.N.M. Nos. 114225-114228). OAXACA: Matías Romero, January 25, 1940 (U.S.N.M. No. 114231); Tehuantepec, January 14 and 25, 1940 (U.S.N.M. Nos. 114229-114230). TABASCO: Tenosique, June 30, 1939 (U.S.N.M. Nos. 114217-114218). VERACRUZ: Potrero Viejo, December 27, 1938, January 1 and September 26, 1939 (U.S.N.M. Nos. 114210-114216).

**Genus MICROBATRACHYLUS Taylor, 1940**

**MICROBATRACHYLUS HOBARTSMITHI (Taylor)**

*Eleutherodactylus hobartsmithi* TAYLOR, Trans. Kansas Acad. Sci., vol. 39, 1936 (July 2, 1937a), pp. 355-357, pl. 1, figs. 5-6 (Uruapan, Michoacán).  
*Microbatrachylus hobartsmithi* TAYLOR, Univ. Kansas Sci. Bull., vol. 26, No. 15, 1939 (1940g), pp. 501-502.

The collection contains a single specimen from 10 miles west of Villa Victoria, México, México, March 6, 1939 (U.S.N.M. No. 115481). Field notes record that the concealed surfaces of the thigh, shank, and foot, as well as the ventral surfaces of the hindlegs, are pink; dorsal surface of head and areas on back and dorsal surfaces of legs are green.

**MICROBATRACHYLUS IMITATOR Taylor**

*Microbatrachylus imitator* TAYLOR, Univ. Kansas Sci. Bull., vol. 28, pt. 1, No. 5, May 15, 1942c, pp. 70-71, pl. 6,<sup>1</sup> figs. 1, 1a, 1b, 1c (La Esperanza, Chiapas).

The type and one paratype, U.S.N.M. No. 115508 from La Esperanza, Chiapas, May 15, 1940, and U.S.N.M. No. 115700 from Colonia Hidalgo, 8 km. north of La Esperanza, Chiapas, April 14, 1940, are the only known specimens. The species is diminutive; the type measures 14.2 mm., the paratype only 10 mm. The coloration mimics that of *Eleutherodactylus dorsoconcolor* Taylor.

**MICROBATRACHYLUS MINIMUS Taylor**

*Microbatrachylus minimus* TAYLOR, Univ. Kansas Sci. Bull., vol. 26, No. 15, 1939 (1940g), pp. 507-508, pl. 56, figs. C and D (Agua del Obispo, Guerrero).

This species is represented in the collection by a series of 17; of these 13 are from Potrero Viejo, Veracruz (December 13-21, 1938), three

<sup>1</sup> The figure of the type purports to be U.S.N.M. No. 17137. This is a field number, and is now No. 115508 of the permanent series.

specimens are from Cuautlapan (January to February, 1940), and a topotypic specimen is from Agua del Obispo, Guerrero, August 31, 1939.

The Potrero specimens (U.S.N.M. Nos. 115446-115458) seem to agree very well with the type from Guerrero. The dark markings on the occiput are more clearly a pair of stripes which begin on the inner edge of the orbits and tend to meet shortly on the median line, forming a V. In certain topotypic specimens this may be represented by a black spot. A few other differences may be due to preservation. The dorsal coloration is usually nearly uniform, varying from clay to light brown in different specimens. A hair-fine median dorsal line is present or indicated in most of the specimens. The sides are variegated, darker than the back. The dorsal coloration is frequently limited by a black, discontinuous line. The inguinal gland is larger than that in *pygmaeus*, which occurs in the same locality.

The two specimens from Cuautlapan (U.S.N.M. Nos. 115459-115460) show the ridges, folds, and tubercles rather strongly, probably due to having been preserved in formalin. U.S.N.M. No. 115446, from Agua del Obispo, Guerrero, is a topotype.

#### MICROBATRACHYLUS ALBOLABRIS Taylor

*Microbatrachylus albolabris* TAYLOR, Univ. Kansas Sci. Bull., vol. 26, No. 15, 1939 (Nov. 27, 1940g, first mailing), pp. 502-504, pl. 56, figs. A, B (2 miles west of Córdoba, Veracruz).

The collection contains 18 specimens from Potrero Viejo (December 14-21, 1938), and Cuautlapan, Veracruz (January to February 1940); La Esperanza, Colonia Hidalgo, and Salto de Agua (Mount Ovando) (April 11-18, 1940), Chiapas.

The southern specimens differ somewhat from the northern ones but perhaps no more than the northern specimens differ among themselves, except that the digital disks of fingers and toes are very slightly narrower. The present known distribution includes southern Veracruz, southern Guerrero, and southern Chiapas. They occur usually in low mountains or foothills. The specimen from Salto de Agua is from an elevation of 1,200 feet, those from Cuautlapan from about 2,500 feet.

Potrero Viejo: U.S.N.M. Nos. 115462-115466. These are preserved in weak alcohol and have absorbed too much liquid. They have in consequence an overstuffed appearance and the tubercles and ridges are nearly obsolete. In spite of having been collected in the daytime, the specimens are very light colored.

Cuautlapan: U.S.N.M. Nos. 115467-115476. These were taken in daytime also and preserved in formalin; in consequence, the ridges and tubercles stand out very strongly. They are darker but the essential pattern is evident, and several have the median hair-fine line and the trifoliate or quadrifoliate light mark on the head.

Salto de Agua: U.S.N.M. No. 115479. This specimen is very close to the Potrero Viejo specimens. The head is darker, but under water the variation between the black lines and the somewhat lighter color of the interorbital region is evident. The venter is cream and the white labial line continues back on the arm. The labial light line is bordered below by a black line. Collected at night.

La Esperanza: U.S.N.M. No. 115477. Similar to the above. The pigment under the tibia is a little thicker, and encroaches more on underside of the femora. The skin is rather smooth as in the previous specimen, probably due to manner of preservation. There is scarcely a trace of a dark line below the labial light line.

Colonia Hidalgo: U.S.N.M. No. 115478. This specimen seems to differ from the typical more than any of the others. There is a dark interorbital bar, and there is more pigment everywhere save on the median dorsal line, which normally is darker than the sides. The specimen was dead when preserved, and the toes are somewhat shriveled. The dorsal folds are typical. The cream labial line is bordered below by a black line.

#### MICROBATRACHYLUS MONTANUS Taylor

*Microbatrachylus montanus* TAYLOR, Univ. Kansas Sci. Bull., vol. 28, pt. 1, No. 5, May 15, 1942c, pp. 67-69, pl. 6,<sup>2</sup> figs. 2, 2a, 2b, 2c (Mount Ovando, Chiapas).

The type, U.S.N.M. No. 115507, a large female, was obtained at about 6,000 feet elevation on Mount Ovando, April 15, 1940. Four paratypes, U.S.N.M. Nos. 115701 and 115480, La Esperanza, April 11, 1940; U.S.N.M. No. 115702, Las Nubes, April 15, 1940; and E.H.T.-H.M.S. No. 27846, Salto de Agua, April 18, 1940, were also collected in Chiapas.

This species is the largest one known of the genus, the female type measuring 27 mm. from snout to vent.

#### MICROBATRACHYLUS OAXACAE Taylor

*Microbatrachylus oaxacae* TAYLOR, Univ. Kansas Sci. Bull., vol. 26, No. 15, 1939 (Nov. 27, 1940g, mailing date), pp. 504-507 (Cerro San Felipe, Oaxaca, Oaxaca).

Two topotypic specimens from Cerro San Felipe, Oaxaca, July 10-20, 1940, U.S.N.M. Nos. 115444 and 115445, and a third specimen, U.S.N.M. No. 115443, from Lachiguiri, Oaxaca, January 20, 1940, are in the collection.

The feature by which this form may be most readily distinguished is the presence of an outer palmar tubercle. The limb is longer, and the tibiotarsal joint reaches beyond the snout.

<sup>2</sup> The National Museum number published for this type specimen is 14772. This is a field number. The permanent number is U.S.N.M. No. 115507.



## MICROBATRACHYLUS PYGMAEUS (Taylor)

*Eleutherodactylus pygmaeus* TAYLOR, Trans. Kansas Acad. Sci., vol. 39, 1936 (July 2, 1937a), pp. 352-354, pl. 1, figs. 3, 4 (Rodríguez Clara, Veracruz).  
*Microbatrachylus pygmaeus* TAYLOR, Univ. Kansas Sci. Bull., vol. 26, No. 15, 1940g, pp. 500-501.

Two large series were taken, one from the north in the regions about Potrero Viejo and Cuautlapan, Veracruz, the other from the south, in Chiapas. A smaller series, somewhat less typical, was collected in Guerrero. In all, 237 specimens were secured.

Potrero Viejo specimens (U.S.N.M. Nos. 116840-116842; 116864-116870), collected from December 13, 1938, to January 9, 1939, are relatively uniform in character. There is the merest trace of a web between the toes; the digits are moderately dilated at the tip; and the skin is slightly pustular and corrugated. There is usually a single indistinct supernumerary tubercle on the sole in advance of the outer metatarsal tubercle.

In specimens from Cuautlapan, collected from January 4 to 16, 1939, and in January and February, 1940 (U.S.N.M. Nos. 116871-116875) the skin appears very much rougher, presumably because of its long preservation in strong formalin.

The southern specimens are from the following localities: OAXACA: U.S.N.M. No. 116826, Matías Romero, January 25, 1940. CHIAPAS: U.S.N.M. Nos. 116831-116833, La Esperanza, April 11 and May 18, 1940; U.S.N.M. Nos. 116834-116837, Colonia Hidalgo, April 14, 1940; U.S.N.M. Nos. 116838-116839, Colonia Soconusco, April 14 and May 10, 1940; U.S.N.M. Nos. 116843-116854, Las Nubes, Cerro Ovando, April 15, 1940; U.S.N.M. Nos. 116828-116830, Finca Juárez, May 8-10, 1940; U.S.N.M. No. 116827, La Magnolia, May 23, 1940; U.S.N.M. Nos. 116855-116863, Salto de Agua, Mount Ovando, April 18 to May 19, 1940.

These latter specimens vary more among themselves than the northern forms, perhaps because they are from a greater variety of elevations.

The skin is apparently less pustular and less corrugated than in those from the northern part of its range, but this may be due to method of preservation. A few specimens have an irregular, diagonal, black-edged whitish stripe on the side. The single supernumerary tubercle on the sole is absent and there is usually a little more pigment on the venter.

The series from Guerrero, U.S.N.M. Nos. 116817-116825, August 31, 1939, resembles the specimens from Veracruz more than those from Chiapas. The skin is usually pustulate and corrugated, and the pigment on the venter is not dense. One specimen has a broad median light stripe. This same character has been observed in two Cuautlapan, Veracruz, specimens, but it is of rare occurrence.

Genus **ELEUTHERODACTYLUS** Duméril and Bibron, 1841**ELEUTHERODACTYLUS ALFREDI** (Boulenger)

*Hylodes alfredi* BOULENGER, Proc. Zool. Soc. London, 1898, pp. 480-481, pl. 39, fig. 1 (Atoyac, Veraacruz, México).

*Eleutherodactylus alfredi* KELLOGG, U. S. Nat. Mus. Bull. 160, 1932, p. 99.

This species has been found to be relatively common in the general region about Córdoba. Our series of 76 specimens was acquired at Cuautlapan, Veraacruz, January 2-16, 1939, January to February and August 7-14, 1940, a few hundred feet higher than the type locality of Atoyac, which lies to the northeast about 30 km. Specimens here were taken below the sheaths of banana leaves. U.S.N.M. Nos. 116491-116505 are cataloged.

The species attains a known maximum size of 45 mm., there being one female of this length; the largest known male is 30.2 mm. The width of the toe disks is greater than the tympanum in the females, smaller in the males. Measurements of a large female and a large male show the following: Tympanum, in female, 2.45 mm., about half the length of eye (5.1 mm.); largest finger disk, 2.8 mm. Of the male, the tympanum, 3.1 mm., about three-fourths of eye (4 mm.); largest finger disk, 2 mm.

The variation in color is not great. In life the specimens are olive, gray, or olive-brown, rarely somewhat greenish. Young males show some dorsal pattern that is more or less symmetrically placed; but it is almost entirely lost in adults. In these the pigment is rather evenly distributed with a faint suggestion of a dark interorbital region. While young specimens show some bars on the legs, they are obsolete in adults; some of the larger females show some scattered cream flecks.

The inner tarsal fold is present, extending nearly half the distal length of tarsus. It is distinctly lateral and not conspicuous. There is no evidence of the inguinolumbar gland or the axillary gland, nor is there a parotoid. If these glands are present they are diffused. The vomerine teeth are well developed, and the tongue is subcircular and somewhat emarginate behind. The dorsum lacks ridges and tubercles except that a trace of a dorsolateral ridge is often evident; however, the back is minutely tubercular seen under the lens. The ventral disk is absent or barely indicated, and only the edges of the venter show any areolation.

Preserved specimens may be light gray to dark brown; the underside of the hindlimbs and the posterior part of the femur are rather heavily pigmented; only the median abdominal region may lack pigment. One character seemingly invariable and usually evident in preserved specimens is the grayish center of the tympanum. This in turn is surrounded by a brownish ring, while the edge of the tympanum is grayish.

## ELEUTHERODACTYLUS CONSPICUUS, new species

## FIGURE 60, A

*Type*.—U.S.N.M. No. 116509, collected at Piedras Negras, Guatemala, near the México-Guatemala border, by Dr. and Mrs. Hobart M. Smith, May 29, 1939.

*Paratypes*.—U.S.N.M. Nos. 116506–116508, 116510–116511, and E.H.T.-H.M.S.No. 29807. Topotypes. Same collectors, May 24 to June 10, 1939.

*Diagnosis*.—Related to *Eleutherodactylus alfredi* and, like that form, lacking a vocal sac and having the tips of the digits strongly dilated. Differing from *alfredi* in lacking a tarsal fold, in having shorter hindlegs with the tibiotarsal articulation reaching only to the nostril instead of beyond the snout tip; the vomerine teeth barely reach the posterior level of the choanae, instead of to the middle of the choanae. The color and markings are different.

*Description of the type*.—Adult female. Head length (18 mm.) a little greater than width (16.5 mm.); width of an eyelid a little less than the interorbital width, which is in turn one-fourth greater than the distance between the nostrils, and about two-thirds the distance between eye and nostril; diameter of the tympanum (2.8 mm.) a little more than half the diameter of eye (5 mm.); canthus rostralis rounded but more or less distinct, the lores concave, then sloping very obliquely to the edge of lip; areas about nostrils slightly elevated, with a visible depression between them on top of snout. Choanae large, but smaller than area of a group of vomerine teeth, which barely reach the posterior level of choanae, anteriorly; tooth groups separated by a distance equal to about half width of a single group; tongue subcircular, free posteriorly for about one-fourth its length, not emarginate behind. (Vocal sac absent in males.)

Arm moderate in length; the first finger shorter than the second; the disks unequal, with strong transverse grooves; the disks of at least the two outer fingers emarginate (somewhat bilobed) medially; diameter of disk on third finger (2.4 mm.) a little less than the diameter of tympanum; no trace of a web, but lateral edges of fingers with a trace of a ridge; three palmar tubercles, the outer partly confluent with the very large median tubercle; a few supernumerary tubercles on the palm; heels overlap about 1.5 mm.; the tibiotarsal joint reaches to the nostril; toe disks dilated, smaller than those of the fingers, the three outer disks somewhat emarginate; a large, elongate, somewhat compressed inner metatarsal tubercle; outer metatarsal tubercle small, round; three supernumerary tubercles on the sole; tarsal fold absent (a fairly strong tarsal fold in *alfredi*); third and fifth toes equal; fourth relatively short.

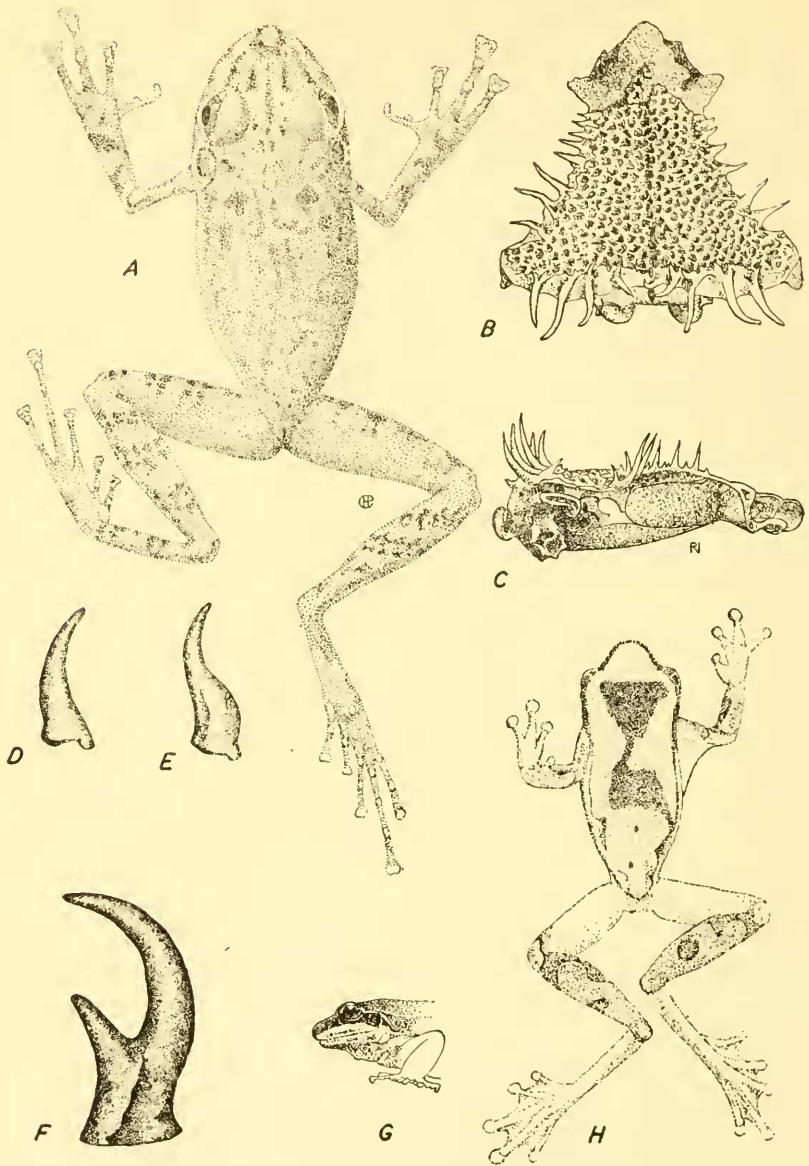


FIGURE 60.—*A*, *Eleutherodactylus conspicuus*, new species, E.H.T.-H.M.S. No. 29853, paratype, Piedras Negras, Guatemala; snout-to-vent length 41 mm. *B*, *Anotheca coronata* (Stejneger), E.H.T.-H.M.S. No. 29985, Cuautlapan, Veracruz; dorsal view of brain case, enlarged. *C*, Same; lateral view, enlarged. *D*, *Plectrohyla matudai* Hartweg, E.H.T.-H.M.S. No. 27050, Cerro Ovando, Chiapas; spur from pollex, enlarged. *E*, *Plectrohyla sagorum* Hartweg, E.H.T.-H.M.S. No. 26629, Cerro Ovando, Chiapas; spur from pollex, enlarged. *F*, *Plectrohyla guatemalensis* Brocchi, M. C. Z. No. 11150, Panajachel, Guatemala; spur from pollex, enlarged. *G*, *Eleutherodactylus beatae* (Boulenger), E.H.T.-H.M.S. No. 29813, Tequeyutepec, Veracruz; lateral view of head. *H*, *Hyla ebraccata* Cope, U.S.N.M. No. 111150, Piedras Negras, Guatemala.

Skin more or less rough above when examined under a lens; sides distinctly granular; venter completely smooth; inguinolumbar gland absent or concealed; no discernible axillary gland; the greater part of the under surface of femur, and part of the posterior face, granular; loreal region with small pustules, and the snout likewise; a faint median ridge the length of the body.

*Color.*—Ground color cream with numerous small brown spots or irregular flecks, more or less equally distributed on head, body, and sides; spots sometimes confluent; venter light but lightly pigmented except for a narrow medial area on abdomen; arms and legs barred, but the bars broken up into small spots; the upper lips barred.

*Measurements in mm.*—U.S.N.M. No. 116509 (type), E.H.T.—H.M.S. No. 29807, U.S.N.M. No. 116511. Sex, ♀, ♀, ♂; snout to vent, 42.5, 40, 33; width of head 16.5, 15, 12.5; length of head, 18, 16.8, 13; arm, 29, 26.2, 24; leg, 68, 61, 53.5; tibia, 23.5, 21.8, 19.5; foot, 28.2; 26.5, 23.6.

*Variation.*—The tympanum (2.3 mm.) in the largest male is a little more than the half of the eye diameter (4.2 mm). There is a little difference in the relative size of the vomerine tooth groups and the choanae, or their position with relation to each other. One or two of the specimens have the series a little closer together than in the type.

The toes show practically no trace of web at their bases and the lateral edges have only a very faint trace of a lateral ridge. (In *alfredi* there is a small remnant of a web between the bases of the toes, and the edges of the digits have strong lateral ridges or narrow fringes to the disk.) The males are very much smaller than the females.

The recently described *Eleutherodactylus xucanebi* Stuart, from Alta Verapaz, Guatemala, is related. The species have totally different color patterns, and the present one is considerably larger since the type of *xucanebi* is a fully adult female and is only of the size of the male in this species. *E. xucanebi* is a mountain form, coming from an elevation above 4,000 feet, while the present species is a foot-hills form (500 feet).

*Remarks.*—Specimens of the type series were found at night sitting on vegetation a few feet above the ground.

#### ELEUTHERODACTYLUS HIDALGOENSIS Taylor

*Eleutherodactylus hidalgoensis* TAYLOR, Univ. Kansas Sci. Bull., vol. 28, pt. 2, No. 14, Nov. 15, 1942d, pp. 299–301, pl. 25, figs. 5–8, pl. 27, fig. 10 (4 miles north of Tianguistengo, Hidalgo).

A single specimen is in the collection from Tequeyutepec, Veracruz (U.S.N.M. No. 116490), collected March 23, 1940. It is a male with greatly elongated vocal slits.

The specimen measures 29 mm. from snout to vent, which is approximately the size of the type. On the occiput are two small black

tubercles and somewhat behind these a second similar pair, a little farther apart. There is indication of a W-shaped dark mark on the shoulders, touching the anterior pair. The tibiotarsal articulation reaches  $3\frac{1}{2}$  to 4 mm. beyond the tip of the snout and the heels overlap a similar distance.

The palmar pads and the metatarsal tubercles are a trifle larger than in the type.

The specimen was found at night during a drizzling shower by following the call. After fully half an hour of waiting, as the frog croaked only at long intervals, it was finally found perched in the crotch of a limb on a small tree, at an elevation of 6 feet above ground. The call is a short nasal "croak" repeated in quick succession two or three times. This call sounds more like the call of a *Rana*, and is very unlike the known calls of other members of this genus.

#### ELEUTHERODACTYLUS SPATULATUS Smith

*Eleutherodactylus spatulatus* SMITH, Proc. Biol. Soc. Washington, vol. 52, Dec. 15, 1939, pp. 187-190, pl. 2, figs. 4-5 (Cuautlapan, Veracruz).

The type series, field Nos. 3787 (type), 3788, 4391, 4411, 4467, 4470, and 4488 (paratypes), now bear U.S.N.M. Nos. 116926-116932.

#### ELEUTHERODACTYLUS DUNNII Barbour

##### FIGURE 61, E-H

*Eleutherodactylus dunnii* BARBOUR, Proc. Biol. Soc. Washington, vol. 35, Oct. 17, 1922, pp. 111-112 (Cerro de los Estropajos, near Jalapa, Veracruz).

Two large series, totaling 215 specimens, were collected at two localities in Veracruz. Of these 129 were from Tequeyutepec, east of Jalapa (March 3, 1940) and the remainder from Cuautlapan (January 5-16, 1939, January to February and August 7-14, 1940). The following specimens are cataloged: U.S.N.M. Nos. 116771-116778, 117414-117428 from Tequeyutepec and U.S.N.M. Nos. 117429-117447 from Cuautlapan.

*Eleutherodactylus dunnii* is one of the small group of species that includes *E. dorsoconcolor*, *E. beatae*, and *E. venustus*. It is remarkable that four species so similar in general body configuration should occur in the same limited region in central Veracruz. All attain approxi-

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FIGURE 61.—Diagrammatic representation of color patterns of four forms of *Eleutherodactylus*. Since the general body form is similar in all a single outline has been used. *A*, *Eleutherodactylus beatae* (Boulenger), E.H.T.-H.M.S. No. 29813, Tequeyutepec, Veracruz. *B*, *Eleutherodactylus dorsoconcolor* Taylor, E.H.T.-H.M.S. No. 28727, same locality. *C*, *Eleutherodactylus venustus* (Günther), U.S.N.M. No. 116780, same locality. *D*, Same, U.S.N.M. No. 116805, La Esperanza, Chiapas. *E*, *Eleutherodactylus dunnii* Barbour, U.S.N.M. No. 116772, Tequeyutepec, Veracruz. *F*, Same, U.S.N.M. No. 116777, same locality. *G*, Same, H.M.S. No. 13318, same locality. *H*, Same (?), E.H.T.-H.M.S. No. 28763, same locality; this is possibly a distinct species since the pattern of ridges seems to be different from that of more typical *dunnii*.

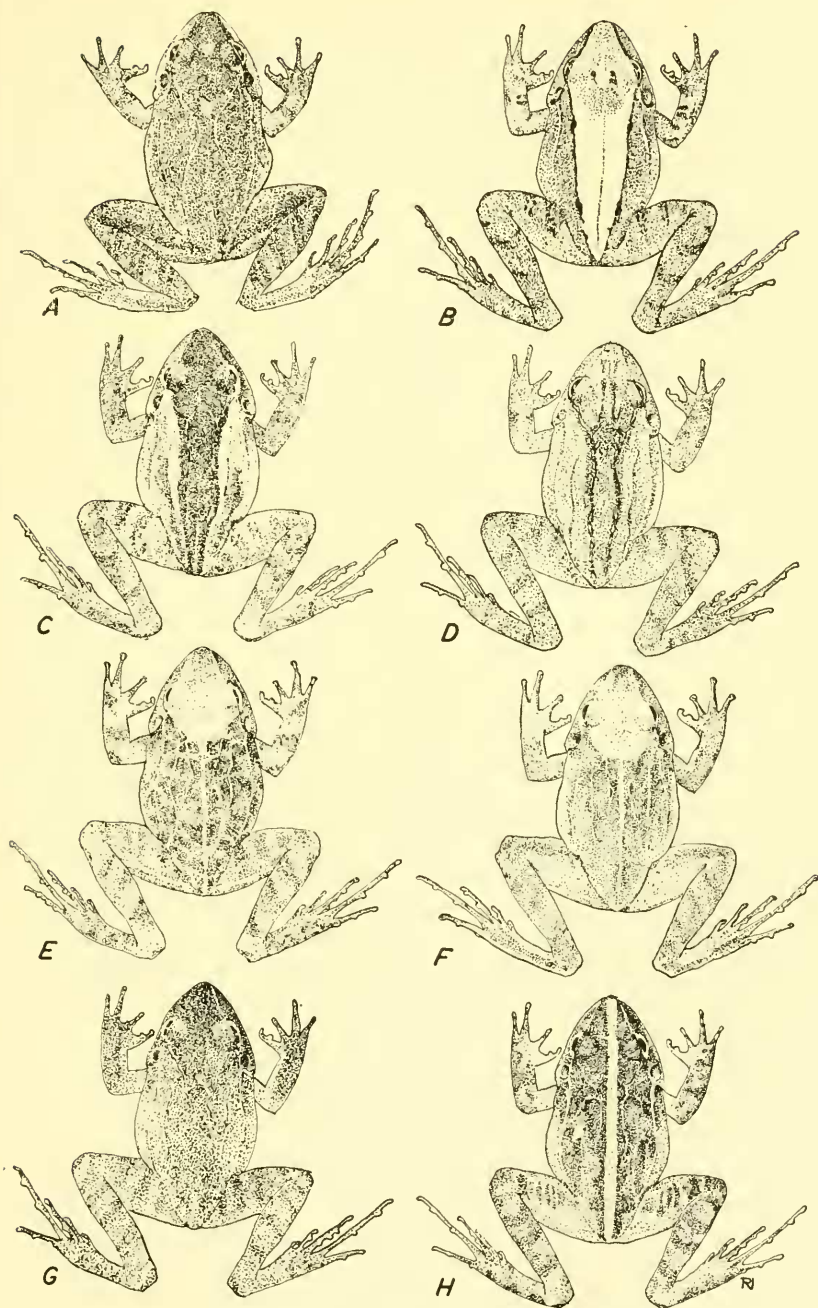


FIGURE 61.—(See opposite page for legend.)

mately the same size and have numerous characters in common. However, they seem to be distinguishable on the basis of color pattern and arrangement of ridges on the back. The latter, however, are often dim, or occasionally absent; in such cases color and markings alone will serve to distinguish the species.

There is, of course, a possibility that all are of the same species and that the dermal ridges and color patterns are linked; hence, when a given color pattern appears it is accompanied by a certain pattern of dermal ridges.

All these forms have been taken in the same locality under the same circumstances, together with two other *Eleutherodactylus* species, *rhodopsis* and *hidalgoensis*.

However, in the collection from Chiapas *E. venustus* has been taken in quantity, but no trace of the other three species appears. A form related to *dunni*, however, does occur.

Two major varieties of *dunni* have been examined. The typical form is variegated olive, or olive with some darker spots, indistinctly barred lips and with the limbs more or less distinctly barred. The axillary gland is larger than that in the inguinal region. The tibio-tarsal articulation reaches beyond the tip of the snout.

In the younger specimens there are interorbital darker markings and a broad, inverted, V-shaped, dark mark on the shoulder. The upper edge of the tympanum is black.

In the second variety (U.S.N.M. Nos. 116771-116777) the head is lighter, sometimes much lighter, than the body. The interorbital dark spot is present and if conspicuous the light color behind it forms a lunate spot. In these there is no inverted V-shaped spot.

Behind the light occipital region there is a hair-fine, light line, which reaches below anus where it joins a transverse cream line extending behind the femora onto the tibia as far as the heel.

The hairline on back is absent in one specimen.

A single specimen (U.S.N.M. No. 116778), olive-brown with a broad median stripe from snout to vent, is referred to *E. dunni* with some hesitation.

#### ELEUTHERODACTYLUS BEATAE (Boulenger)

FIGURES 60, G; 61, A

*Hylodes beatae* BOULENGER, Ann. Mag. Nat. Hist., ser. 7, vol. 12, No. 71, Nov. 1903, pp. 552-553 (La Perla, near Orizaba [6,000 feet elev.], Veracruz, México).

*Eleutherodactylus beatae* KELLOGG, U. S. Nat. Mus. Bull. 160, 1932, pp. 104-105.

A total of 25 specimens was collected; the following have been cataloged: U.S.N.M. Nos. 116756-116757, Cuautlapan, January 16, 1939, January to February, 1940; U.S.N.M. Nos. 116758-116770,



Tequeyutepec, Veracruz, March 23, 1940; and U.S.N.M. Nos. 117411-117413, La Esperanza, Chiapas, April 6-30, 1940.

The series from Veracruz agrees very well with the type description. The white stripe on the lip is constant and invariable; many of the specimens are blackish or purplish black on the anterior part of the body; others are lavender to brown with the anterior part of head and body darker. There is a small indistinct inguinolumbar gland and a small postaxillary gland.

Specimens examined from Cuautlapan have the skin somewhat rougher than those from Tequeyutepec, but we suspect the method of preservation is largely responsible for the difference.<sup>3</sup>

**ELEUTHERODACTYLUS VENUSTUS** (Günther)

FIGURE 61, C, D

*Hylodes venustus* GÜNTHER, Biologia Centrali-Americana, Rept. Batr., August 1900, p. 234, pl. 68, fig. c (Jalapa, Veracruz).

*Eleutherodactylus venustus* KELLOGG, U. S. Nat. Mus. Bull. 160, 1932, pp. 96-97, 117-118.

This variable species is represented by 42 specimens, 37 of which have been cataloged: VERACRUZ: Tequeyutepec, U.S.N.M. Nos. 116780-116800, 116802, March 23, 1940. CHIAPAS: U.S.N.M. Nos. 116803-116813, La Esperanza, April 5 to May 15, 1940; U.S.N.M. Nos. 116815-116816, Salto de Agua, Mount Ovando, April 18, 1940; and U.S.N.M. No. 116814, Colonia Soconusco, May 10, 1940.

Specimens from Tequeyutepec are of several varieties. U.S.N.M. Nos. 116780-116785 are typical, that is, resemble Günther's figure (*loc. cit.*) of the type. They have the broad purplish stripe on the dorsum, flanked by lighter color. U.S.N.M. No. 116799 agrees with these save that there is a broad, light, labial stripe (such as occurs in *Eleutherodactylus beatae*). U.S.N.M. Nos. 116786-116800, 116802 lack the median broad band, but the dorsal ridges usually have narrow darker lines. There is usually a pair of cranial ridges beginning on the occiput and terminating at the tip of the snout. These are frequently indicated also in the typical *E. venustus*.

While only one of these specimens has a labial stripe, several specimens examined in the E.H.T.-H.M.S. collection show such markings.

The median pair of dorsal ridges begin on the top of the cycloid and run back diagonally to the shoulder, then continue a greater or lesser distance on the back, separated by a narrow space. When the stripe is present it usually is a little wider than the area enclosed by the ridges. There is usually a more or less distinct ridge along the side, from behind the supratympanic ridge, and a more or less distinct dorsolateral ridge beginning on the shoulder. Rarely a pair of head ridges is indicated.

<sup>3</sup> Specimens preserved in weak solutions often absorb the liquid until the skin is somewhat distended, in which case the ridges and pustules on the back may be somewhat obscured.

In the specimens with the less distinct or no dorsal stripe, the various ridges are followed by darker lines. The head ridges are present and join the dorsal ridges on the occiput.

In the Chiapas specimens, some have the broad dorsal stripe, tending in one case to be broken medially. In these the bordering lighter areas suggest the appearance of a lateral stripe. The greater portion, however, lack the broad median stripe, but the various ridges are followed by more or less distinct darker lines. None show a white labial stripe. The vomerine teeth are larger and more prominent in these than in the northern specimens.

Though there are certain differences between the northern and southern specimens, we believe only a single variable species is involved.

**ELEUTHERODACTYLUS DORSOCONCOLOR** Taylor

FIGURE 61, B

*Eleutherodactylus dorsoconcolor* TAYLOR, Univ. Kansas Sci. Bull., vol. 27, pt. 1, No. 8, 1943a (December), pp. 152-154, pl. 10 (Tequeyutepec, Veracruz).

The type, U.S.N.M. No. 110619, and paratypes, U.S.N.M. Nos. 110615-110618, are in the collection, found March 23, 1940.

The strongly defined dorsolateral ridges, and absence of paired median ridges, together with the distinctive coloration, seem to set this species off from the related *E. beatae*, *E. dunnii*, and *E. venustus*.

**ELEUTHERODACTYLUS CACTORUM** Taylor

*Eleutherodactylus cactorum* TAYLOR, Univ. Kansas Sci. Bull., vol. 25, No. 17, 1938 (July 10, 1939b), pp. 391-394, fig. 2 (Kilometer 226, about 20 miles northwest of Tehuacán, Puebla).

A single, very light colored specimen was acquired at the exact type locality, northwest of Tehuacán, Puebla, September 21, 1939 (U.S.N.M. No. 116489).

One of us (Taylor) observed here on one occasion a group of four very young specimens of this species moving along early in the morning. They kept together and moved perhaps 10 yards during the several minutes they were watched. Their path was rather devious, but at no time were they separated by more than three or four inches. They behaved very much as a flock of chickens, and it seemed a normal, rather than chance, behavior.

**ELEUTHERODACTYLUS AUGUSTI** (Dugès)

PLATE 24, FIGURES 7, 8

*Hylodes augusti* DUGÈS, in Brocchi, Bull. Soc. Philom. Paris, ser. 7, vol. 3, 1879, p. 21 (Guanajuato, Guanajuato).

*Eleutherodactylus augusti* KELLOGG, U. S. Nat. Mus. Bull. 160, 1932, p. 100.

Two specimens, U.S.N.M. Nos. 116420 and 116421, are from Agua del Obispo, Guerrero. They were found hopping on the ground in open pine forest at night, September 31, 1939.

The two specimens differ somewhat, one having the head slightly flatter than the other, with the jaws flaring out more. Both are females containing ovarian eggs. The chin is heavily mottled with brown in one, and light in the other.

**ELEUTHERODACTYLUS MEXICANUS (Brocchi)**

*Leuiperus* [sic] *mexicanus* BROCCHI, Bull. Soc. Philom. Paris, ser. 7, vol. 1, No. 4, 1877, p. 184 (México, probably southeastern México).

*Eleutherodactylus mexicanus* (part) KELLOGG, U. S. Nat. Mus. Bull. 160, 1932, pp. 108–112.—TAYLOR, Univ. Kansas Sci. Bull., vol. 28, pt. 1, No. 5, May 15, 1942c, p. 73, pl. 8, figs. 2, 2a–c.

A series of 20 specimens was obtained by Thomas MacDougall on Cerro de las Flores, Lachiguiri, Oaxaca, January 20, 1940 (U.S.N.M. Nos. 116462–116479 cataloged), at an elevation of 7,100 feet. The specimen figured by Taylor (*loc. cit.*) under the field number S. 12752 is now U.S.N.M. No. 116475.

One other specimen, collected at Pan de Olla, near Teziutlán, Puebla, U.S.N.M. No. 116480, is referred to this species. It differs somewhat in having the femora shorter, so that the heels overlap a little, while in the adults of the southern specimens the femora are longer and the heels barely touch. Some other slight differences are in evidence, but a series must necessarily be available before it is certain that we are not dealing with an individual variation.

The inner metatarsal tubercle of *Eleutherodactylus mexicanus*, while well developed, is smaller than that of either *E. calcitrans* or *E. occidentalis*.

**ELEUTHERODACTYLUS MATUDAI Taylor**

*Eleutherodactylus matudai* TAYLOR, Univ. Kansas Sci. Bull. vol. 27, pt. 1, No. 8, 1941e (December), pp. 154–157, pl. 11 (Cerro Ovando, Chiapas.)

Eleven specimens, comprising the type and paratype, U.S.N.M. Nos. 110626 (type), 110620–110625, 110627–110630, are in the collection. The specimens were obtained at night as they were sitting on stones and gravel in and near a small, steep rivulet, at an elevation of about 6,000 feet, on April 16, 1940. The habitat and general habitus strongly suggested *E. rugulosus* in the field, with which they were confounded at first sight. That species, however, common from about 500 feet to at least 3,500 feet, was not taken at elevations above 5,000 feet, where it is replaced by *matudai*.

**ELEUTHERODACTYLUS CALCITRANS (Günther)**

*Hylodes calcitrans* GÜNTHER (part), Biologia Centrali-Americana, Rept. Batr., August 1900, p. 230, pl. 67, fig. B (“Omiteme, Guerrero, and Jalisco”; here restricted to Omiteme, Guerrero).

*Eleutherodactylus calcitrans* TAYLOR, Proc. Biol. Soc. Washington, vol. 54, 1941c, p. 93.

A single topotypic specimen (U.S.N.M. No. 116481) is in the collection from Omiteme, Guerrero, July 10–20, 1940. It exhibits the

short limbs and the very large inner metatarsal tubercle, which is not compressed as in *Eleutherodactylus occidentalis* Taylor.<sup>4</sup>

ELEUTHERODACTYLUS RHODOPIS (Cope)

*Lithodytes rhodopis* COPE, Proc. Acad. Nat. Sci. Philadelphia, vol. 18, 1866c, p. 323 (Orizaba and Córdoba).

*Eleutherodactylus rhodopis* KELLOGG, U. S. Nat. Mus. Bull. 160, 1932, pp. 97-98, 112-115.

On Atlantic slopes 215 specimens of this species were collected, of which the following specimens are cataloged in the collection: GUATEMALA: U.S.N.M. Nos. 116899-116900, Piedras Negras, May 21 to June 21, 1939. CHIAPAS: U.S.N.M. No. 116901, San Juanito, near Palenque, July 16, 1939. OAXACA: U.S.N.M. No. 116902, Matías Romero, January 25, 1940. VERACRUZ: U.S.N.M. No. 116903, 116906, Potrero Viejo, December 13, 1938 to January 9, 1939; U.S. N. M. No. 116907, Cuautlapan, January 16, 1939.

In specimens from Potrero Viejo, Veracruz, not far from the type locality, the ground color is light clay, fawn, brownish, or pinkish. A black stripe begins on the tip of the snout and runs on the upper part of the lores to the eye; behind the eye the stripe is continued as an elongate black spot bending about the tympanum. The tip of the snout is whitish. The lips are not barred with black but there is some suggestion of mottling and indistinct lighter dots in some specimens. Black spots in front of knee; in two specimens there is a hair-fine light median line. There is a black triangular anal spot, and paired black spots on the shoulder. The supratympanic fold is moderate, not closely approximated to the tympanum posteriorly; and the snout in front of nostrils is relatively short. They differ very little in structural characters from the Guatemala specimens.

None of the specimens from central Veracruz are from elevations above 2,500 feet.

The Guatemala specimens from Piedras Negras form a series that is more definitely marked and colored, containing many pinkish or reddish individuals. However, some of these are grayish, clay-colored, or brownish. Of 25 females all except one appear to contain large ovarian eggs. Ten of these have a hair-fine, more or less distinct, median cream or white line, and white lines running lengthwise on the posterior face of the femur, in one case extending the length of the tibia to the heel. Two black shoulder spots, rather closely approximated, are distinct in all save two specimens. Three are more or less brown mottled on the dorsal surfaces. The distinctness of the brown transverse bars on the femora varies greatly.

The side of the head has a black stripe bending down behind the tympanum and widening; in front of the eye it reaches almost to the edge of the lip anteriorly; the lower part of the loreal region is blackish,

<sup>4</sup> Formerly *Borborocoetes mexicanus* Boulenger (1898, p. 481), preoccupied by *Leuiperus mexicanus* Brocchi (1877, p. 184) (see original designation, Taylor, 1941c, pp. 91-92).

but lighter specimens may show spotting; the tympanum is brownish. The chin may be more or less brownish, with irregular cream spots on the lower jaw. In some specimens these markings are scarcely discernible. The underside of the outer part of the femur is brownish, with some black spotting at the knee. The underside of the foot is dark. The anal region has a triangular dark area or a black arched line.

The inguinolumbar gland is greatly reduced, diffuse, and concealed by the pigment so that it is rarely evident. A small, flat axillary (or postaxillary) gland is evident in all. First finger longer than second; outer palmar tubercle present, sometimes apparently free, sometimes partly fused to the medial; several supernumerary tubercles on the soles and palms. The tibiotarsal articulation reaches to the anterior edge of eye or a slight distance beyond save in a young female (without eggs) in which the heel reaches near to nostril. The tarsal fold (tubercle) is situated on tarsus back of the inner metatarsal tubercle a distance less than the length of the tubercle, and terminates at its highest point before the middle of the tarsus is reached. The tubercle is narrow and somewhat elongated.

Most of the venter is smooth, but the back part of the ventral disk and its sides are usually granular; vomerine teeth large; males with a vocal sac.

On the Pacific drainage of Chiapas occurs a variable species, identical or at least closely related to the preceding. Individuals vary in color much as do the northern ones, some being pinkish, others fawn; occasional specimens have a hair-fine median light line. In general the measurements, character of the skin folds, metatarsus, and hand and foot markings agree very well with those of northern specimens, save that some specimens have a larger external metatarsal tubercle. However, in the Chiapas series are individuals or groups of individuals that, at least in the adult, vary in having a larger eye, a slightly longer snout in front of nostrils, and a heavier supratympanic fold folding down closer to the tympanum. There is less pigmentation on lower jaw, the loreal black stripe is dim or lacking, and the lip may show dark bars.

While the shoulder ridges in the typical form run from the paired black shoulder spots direct to the corner of eye, in these the ridge may make a bend at two widely spaced occipital (or shoulder) spots and then direct themselves to a point on the eyelid somewhat more medial than the corner of eye. Often there is a pair of dark spots at the beginning of the two dorsolateral ridges. Sometimes the back may be somewhat checkered with darker, or there may be an indistinct, somewhat geometric pattern on the front part of the back. The underside of arm and foot and the tarsus are usually lighter than in the typical form.

The vomerine tooth series of the adults are heavier and bear more teeth than the average typical specimen. The tympanum is (in females) somewhat more circular than in the typical form where it is usually a little higher than wide, and the inner metatarsal tubercle is larger.

The following have been cataloged from a series of 219 collected: CHIAPAS: U.S.N.M. Nos. 116908–116913, Colonia Soconusco, May 10, 1940; U.S.N.M. Nos. 116914–116920, Tonalá, January 26–30, 1940; U.S.N.M. No. 116921, Las Nubes, April 15, 1940; U.S.N.M. Nos. 116922–116927, Finca Juárez, May 8–10, 1940; U.S.N.M. Nos. 116928–116937, Cruz de Piedra, April 25, 1940; U.S.N.M. Nos. 116938–116944, Las Gradass, May 20, 1940; U.S.N.M. Nos. 116945–116953, Salto de Agua, April 18 to May 19, 1940; U.S.N.M. Nos. 116954–116959, La Esperanza, April 4–5 and June 4, 1940.

Cope has described three related eleutherodactylid forms from Central America as distinct species: *Lithodytes podiciferus*, *muricinus*, and *habenatus* (1876, pp. 107–108). He later (1879, p. 268) identified certain Oaxaca specimens as belonging to *podiciferus*; and in a still later paper (1893, p. 338) these three presumed species were thrown back into the synonymy of *rhodopis*. It seems probable that some of these names may be referable to the variants here recorded.

#### ELEUTHERODACTYLUS NATATOR Taylor

*Eleutherodactylus natator* TAYLOR, Univ. Kansas Sci. Bull., vol. 25, No. 17, 1938 (July 10, 1939b, first mailing), pp. 394–397, pl. 39, fig. 2, pl. 40 (Tlilapan [=Cuautlapan], Veracruz).

The collection contains six specimens including five topotypes (U.S.N.M. Nos. 116034–116038) from Cuautlapan, January 4–16, 1939, and January to February, 1940, and No. 116039 from Metlac, Veracruz, January 5, 1939.

This form, apparently a derivative of *Eleutherodactylus rugulosus*, differs in reaching a considerably larger size, having longer limbs, slightly larger disks on the toes, and the heels overlapping several millimeters when the limbs are placed at right angles to the body.

There is an extraordinary sex difference in size. The largest known male measures only 43 mm., while the type, a female, measures 93 mm. The largest female *E. rugulosus* examined (in 735 specimens) measures only 72 mm. and is about one-half the bulk of the female type of *E. natator*.

#### ELEUTHERODACTYLUS RUGULOSUS (Cope)

##### PLATE 23, FIGURES 3, 4

*Liyla rugulosa* COPE, Proc. Amer. Philos. Soc., vol. 11, No. 82, July 16, 1869b, p. 160–161 (Pacific region of the Isthmus of Tehuantepec, México).

*Eleutherodactylus rugulosus* KELLOGG, U. S. Nat. Mus. Bull. 160, 1932, pp. 116–117 (possibly only part).

The collection contains 735 specimens from Chiapas, the following of which are cataloged: U.S.N.M. Nos. 117448–117453 from Colonia Hidalgo, April 14, 1940; U.S.N.M. Nos. 117026–117031, from Tonalá, January 26–30, 1940; U.S.N.M. Nos. 117050–117056, from Finca Juárez, May 8–10, 1940; U.S.N.M. Nos. 117057–117062, from La Magnolia, May 23, 1940; U.S.N.M. Nos. 117063–117067, from Rancho Las Gradass, May 20, 1940; U.S.N.M. Nos. 117068–117071, Cruz de Piedra, April 25 to May 11, 1940; U.S.N.M. Nos. 117044–117049 from Colonia Soconusco, April 14 and May 10, 1940; U.S.N.M. Nos. 117038–117043, La Esperanza, April 15 to May 25, 1940; U.S.N.M. Nos. 117079–117086, Salto de Agua, April 18 to May 19, 1940; U.S.N.M. Nos. 117032–117037, San Juanito, July 6 to 17, 1939; U.S.N.M. Nos. 117072–117078, Las Nubes, April 15, 1940.

Specimens from Salto de Agua for the most part have a broad, brownish, median stripe or a hair-fine, brownish or whitish line. The largest specimen taken in the entire series of 403 was 72 mm. in length and had a head width of 32 mm. The usual, large-sized specimens were between 65 and 67 mm., with the head 30 to 33 mm. in width. The three largest males measured 44, 42, and 41 mm., with head widths of 18, 18, and 17, respectively. Diameter of the tympani of three largest females 4.2, 4.4, and 4.4 mm., respectively; of the three largest males, 5.3, 5.5, and 5.2 mm. The tibiotarsal articulation reaches the nostril. The skin is finely granular on the sides, back part of body, and above the femur. Heels touch or overlap about 1 mm.

In a smaller series from Las Nubes (98 specimens) the two largest females measured 68 and 71 mm.; the largest male 42 mm.; the width of the heads of those three specimens is 32, 33, and 18 mm., respectively.

The fewer specimens from Tonalá, Colonia Hidalgo, Las Gradass, and La Esperanza differ in no important way; none of the males or females are as large as those mentioned above.

#### *ELEUTHERODACTYLUS RUGULOSUS* var.

A series of 37 specimens, collected on February 4 and August 31, 1939, at Agua del Obispo, Guerrero, of which 20 are cataloged (U.S.N.M. Nos. 117006–117025), differ from those listed above in having a shorter shank (the heels not touching when the legs are folded at right angles to the body); and the tibiotarsal articulation reaching to nostril or to a little beyond the tip of snout. The skin is somewhat less granular and pustulous, the pustules on the legs being pearl color. The vomerine teeth are in somewhat smaller groups and the canthal region is more rounded.

The largest female measures 67 mm., the largest male 34. There is no vocal sac.

A single specimen of this form has been examined from near Cuautlapan, Veracruz (E.H.T.—H.M.S. Coll.). It has all the general characters of this form, except that a median cream stripe is present. It differs markedly from the related *Eleutherodactylus natator* from the same immediate region.

**ELEUTHERODACTYLUS AVOCALIS, new species**

*Type*.—U.S.N.M. No. 116885, collected at Tres Cruces, near Tehuantepec, Oaxaca, by Dr. and Mrs. Hobart M. Smith, March, 1940.

*Paratypes*.—U.S.N.M. Nos. 116876–116884, 116886, Tres Cruces, near Tehuantepec; U.S.N.M. Nos. 116887–116888, Cerro Arenal, Oaxaca. Same collectors, January 2–19, 1940.

*Diagnosis*.—A medium-sized species belonging to the *rugulosus* group, probably most closely related to *Eleutherodactylus vocalis*. It differs from that form in that the males lack a vocal sac; the tarsal fold extends three-fourths or more of the length of the tarsus, and is more elevated, forming a free flap; the extent of webbing on the toes is somewhat greater; the first finger is longer than the second; the leg is longer, the tibiotarsal articulation reaching beyond the tip of the snout. An M-shaped pattern is apparently present but indistinct.

*Description of the type*.—The type, an adult female, is the largest specimen, having a snout-to-vent length of 51 mm.; snout rounding in profile, the nostril much nearer the median point of upper lip than eye; eyelid about equal to the interorbital width; length of eye (5.9 mm.) shorter than snout (7.5 mm.), but equal to its distance from anterior edge of nostril; canthus rostralis not or but indistinctly indicated; loreal region with a broad concavity; tympanum subcircular, small, its greatest diameter (3.1 mm.) very little more than half diameter of eye (5.9 mm.), separated from the eye by a distance about equal to the diameter.

Tongue broadly cordiform, notched behind; vomerine teeth in two elevated areas between but considerably behind the choanae, extending even to the level of the palatines, separated from each other by less than one-third the width of one group, separated from choanae by a distance greater than width of a group; choanae large, directed backward as much as downward; immediately behind choanae is a depression and a slitlike pit which lies close to the prevomer ridge; palatal mucous glands opening by a series of slitlike pores in the middle of the palate.

Skin thick, with small smooth pustules; a heavy supratympanic fold, which curves down behind tympanum; two posttympanic tubercles; a pair of folds begin at corners of eyes and run back to the shoulders; indication of a second fold, tending to run parallel to the first; an irregular lateral fold with numerous short folds and tubercles; chin strongly areolate; abdomen areolate and wrinkled; ventral disk not indicated.



Arms short, the digits dilated to a little more than half the diameter of tympanum, and with transverse terminal grooves; first finger distinctly shorter than second; practically no trace of a web except between the bases of first two fingers, but distinct lateral fringes on the distal part of outer side of first finger, medial sides of second and third, and on both sides of fourth, to their bases.

A large, median, semidivided palmar tubercle, and a narrow, elongate, inner palmar tubercle at base of first finger; subarticular tubercles large; supernumerary tubercles variable in size; a tubercular ridge under arm. Legs long, the tibiotarsal articulation reaching beyond tip of snout; toes between one-third and one-half webbed, the webs extending as fringes to the dilated tips; a strongly elevated, inner metatarsal tubercle; a small indistinct outer; a broad, almost flaplike tarsal fold extending four fifths the length of tarsus (or more); subarticular tubercles normal; no trace of supernumerary tubercles; heels overlap two or three millimeters when legs are folded at right angles to body.

*Color and markings.*—Generally olive-gray to brownish gray. A broad, light brown, interorbital bar, bordered behind with darker color and with two dim median light spots on occiput, one behind the other; sides lighter, showing dark spotting or marbling; barring on legs almost obsolete; below creamy white, with some indistinct pigmentation on chin and anterior part of thigh.

*Measurements in mm.*—Snout to vent, 51; length of head, 21; width of head, 22; arm, 30; leg, 85; tibia, 28; foot, 37.

*Variation.*—Some of the younger paratypes show the color pattern more strongly. These have the upper lip, to some extent the lower also, with three or four dark bars or spots. The tympanum in the males is about two-thirds the diameter of the eye.

*Relationships.*—The species is apparently most closely related to *Eleutherodactylus vocalis*, occurring on the edge of the plateau in Michoacán. It differs chiefly in the absence of the vocal sac (and vocal slits); greater amount of webbing on feet; smaller pads in proportion to the tympanum; smaller eye in proportion to snout length; the longer tarsal fold, and its much greater development; the longer hind-legs, with overlapping heels; and the choanae directed more backward owing to the elevation of the anterior rim. Other differences obtain. Three other Mexican forms of this section of the genus are known in México: *Eleutherodactylus rugulosus* in Oaxaca and Chiapas, *E. natator* in Veracruz, and *E. vocalis* in Michoacán.

### Genus SYRRHOPHUS Cope, 1878

#### SYRRHOPHUS PIPILANS Taylor

*Syrrhophus pipilans* TAYLOR, Proc. Biol. Soc. Washington, vol. 53, Oct. 7, 1940d, pp. 95-98, pl. 1 (9 miles south of Mazatlán, Guerrero).

Two specimens were collected at Agua del Obispo, Guerrero, August 31, 1939 (U.S.N.M. Nos. 114078-114079). One other specimen was obtained from Cerro Arenal, near Tehuantepec, Oaxaca, January 19, 1940 (U.S.N.M. No. 114077).

The Cerro Arenal specimen was caught at night hopping in leaves among boulders in a small, rocky, dry arroyo. In life the colors were: "lighter parts of dorsal surfaces of body and limbs metallic gold-green; dark areas on body translucent, dark brown; dark areas on limbs a little lighter, of a somewhat amber color."

**SYRRHOPHUS SMITHI** Taylor

*Syrrophus smithi* TAYLOR, Proc. U. S. Nat. Mus., vol. 89, 1940c, pp. 43-45, pl. 1 (15 miles southeast of Galeana, Nuevo León).

Two specimens (U.S.N.M. No. 108594, type, and E. H. T.-H. M. S. No. 23067, paratype) were collected at the type locality, 15 miles southeast of Galeana, Nuevo León, October 13, 1939.

**SYRRHOPHUS LEPRUS** Cope

*Syrrophus leprus* COPE, Proc. Amer. Philos. Soc., vol. 18, No. 104, 1879, pp. 268-269 (Santa Efigenia, Tehuantepec, Oaxaca).

A series of 14 specimens is present in the collection. These are U.S.N.M. Nos. 114080-114084 from Potrero Viejo, Veracruz, December 13, 1938; U.S.N.M. No. 114093, La Gloria, Oaxaca, January 26-30, 1940; and U.S.N.M. Nos. 114085-114092, Piedras Negras, Guatemala, May 21 to June 15, 1939.

The two groups of specimens differ in that those from Guatemala are darker, with the light areas contrasting more. In life the light areas are yellow, and the dark almost purple.

Cope gives so few details that it is impossible to say whether these specimens agree in all details with the type. When the legs are placed at right angles, the heels overlap a trifle. The inguinal gland is obsolete, but the parotoid is prominent above the arm insertion. The heel reaches the anterior part of the eye. The largest specimen is a female from Guatemala, having a length of 28 mm. The largest specimen from Veracruz is only 24 mm. The tympanum, in all, is more than one-third of the eye, in some equaling two-fifths of the eye diameter. The specimen from La Gloria, Oaxaca, has the dorsal surface somewhat granular or pustular.

**SYRRHOPHUS CYSTIGNATHOIDES** (Cope)

*Phyllobates cystignathoides* COPE, Proc. Amer. Philos. Soc., vol. 17, No. 100, 1877, pp. 89-90 (Potrero, near Córdoba, Veracruz).

*Syrrophus cystignathoides* COPE, Proc. Amer. Philos. Soc., vol. 18, 1879, p. 268.

Four specimens were collected: U.S.N.M. Nos. 114074-114075 at Metlac, near Córdoba, January 21, 1940; U.S.N.M. No. 114076 at Cuautlapan, near Orizaba, Veracruz, August 7-14, 1940; and

U.S.N.M. No. 114053, Huichihuayán, San Luis Potosí, December 12, 1939.

Some of the characteristics of these specimens differ from those recorded for the type. The back is somewhat pustular or tubercular, but the pustules may be small, giving the skin a very smooth appearance. The type description mentions the spots on the back as being large. In these the spots are small and not especially distinct. The tympanum is somewhat less than half of the diameter of the eye. The ventral disk is evident and its posterior part is indistinctly granular.

The largest specimen is a female containing large ovarian eggs. It measures 22.4 mm. in length. The specimen from San Luis Potosí is referred here tentatively. It may actually belong to another species, but is small and may not show all the adult characters. It was found 5 km. north of Huichihuayán in a rotten log, in a field overgrown with shrubs and weeds.

Potrero Viejo specimens were found under stones in a pasture. Those from Piedras Negras were found hopping on the ground at night but certain ones were found under stones during the day. Color notes (Smith) state "light areas on the dorsum are yellow-green in color." Two of the Piedras Negras specimens were taken from the stomach of a snake (*Drymobius m. margaritiferus*).

**SYRRHOPHUS RUBRIMACULATUS, new species**

*Type*.—U.S.N.M. No. 114070, collected at La Esperanza, Chiapas, May 13, 1940, by Dr. and Mrs. Hobart M. Smith.

*Paratypes*.—U.S.N.M. Nos. 114054–114069, 114071, 114072, topotypes, collected between April 5 and May 25, 1940; U.S.N.M. No. 114073, Rancho Las Gradass, Oaxaca, May 20, 1940.

*Diagnosis*.—A small species with a known maximum size of 22.5 mm. length, having a dark purplish or purplish-brown coloration, beset with small reddish spots on head and back. The tympanum a little less than one-third of the eye; first finger shorter than second, the outer palmar tubercle wanting; length of the free part of the fifth toe contained in the length of the fourth, three times; tibiotarsal articulation to middle of eye; choanae not concealed by the overhanging maxillary shelf when seen from below.

*Description of type*.—Adult male. Head oval, wider than the body, the width (8 mm.) slightly less than the length (8.2 mm.); tympanum a little higher than wide, the upper part of the rim indistinct, its longitudinal diameter contained in the length of eye three times; snout (3.2 mm.) a little longer than eye (3.15 mm.); width of an eyelid (2 mm.) about equal to the narrowest interorbital distance (2.13 mm.); nostrils slightly removed from the tip of the snout, the distance between them being 1.9 mm., their distance from the eye 2.73 mm.;

tongue narrowed in front, then widened behind, with a slight notch (most of the specimens with the tongue contracted do not show the notch), and free for about two-thirds of its length. Vocal sac present, the openings well defined; no vomerine teeth; choanae large, rather lateral, not concealed when seen from below.

On the dorsal surface of the head the skin is relatively smooth; the back studded with irregular granules or pustules, and with a hair-fine line or ridge along the middle of back; sides granular, and the entire ventral surface of body smooth; the more medial parts of the ventral surface of the femur and some of the posterior face granular; except for some roughness on the upper surface of femur the limbs are smooth; a moderately well-defined parotoid above the insertion of the arm, and a small, rather indistinct inguinal gland.

Arm long, slender, brought forward about a half of the forearm extends beyond the snout; first finger shorter than the second; tips of the fingers slightly flattened, perceptibly wider than the middle of the finger, with only an indistinct groove at tips of the outer fingers (visible if digit is slightly desiccated). Two palmar tubercles, the median very large, the inner normal; outer tubercle missing; palm with four supernumerary tubercles; subarticular tubercles strong; a few granules scattered on palm and between the bases of the fingers; a few intercalary tubercles.

Leg moderate, the tibiotarsal articulation reaching to the middle of the eye; subarticular tubercles strong, with intercalary and supernumerary tubercles; two small metatarsal tubercles, the outer about half the size of the inner; no tarsal fold or ridge; tips of the digits perceptibly wider than the middle of the toe, with trace of the transverse groove; fifth toe small, slender, the length of its free part one-third the length of the free part of the fourth; no trace of a web.

*Color.*—The dorsal surface of head, body, and limbs purplish brown with scattered irregular light spots; a pair of lines begin on the tip of the snout and run back to eye; legs and arms barred dimly, with the intervening areas light. A dark stripe on the side of the snout, more or less continued behind eye; upper lip spotted; venter light brownish or dirty brownish white; underside of hand and foot purplish. According to field notes, in life the light areas on the back are iridescent gold in color, while those on the limbs and sides tend to be more whitish; all the light areas on the head are bright burnt sienna, and those on neck region are intermediate in color between the red and gold of head and body. In some specimens the red extended more widely over the anterior light areas.

*Measurements of type in mm.*—Snout to vent, 21; width of head, 8; length of head, 8.2; arm, 14; leg, 31; tibia, 9.2; foot, 15.

*Variation.*—There is very little difference in the size of the males and females in this series. Measurements of the entire series vary

between 19 and 22.5 mm., the average for both sexes being 21, for the males alone 20.6 mm.

The amount of the light spotting differs in different specimens. In some the spots may be smaller and more numerous, in others larger as if some of them had become confluent. The lines on the snout vary in distinctness but, if specimens are placed under clear water, the pattern can usually be discerned. There is but very slight difference in the size of the tympanum in the two sexes.

*Syrrhophus leprus*, which occurs in the northeastern part of Chiapas, can be distinguished by the more reticulated, cream-colored pattern on a purplish background, the larger size, and the presence of the outer palmar tubercle. This form probably averages (for females) 30 mm. in length. From the recently described *Syrrhophus nebulosus* which occurs in the same locality (generally), it may be distinguished by its smaller size, darker venter, narrower interorbital width and the different color pattern. The latter species, however, lacks the outer palmar tubercle also.

These specimens were found at night hopping on the ground in coffee groves or in uncleared forest. Others were encountered during the day in or about rotting logs.

#### Genus TOMODACTYLUS Günther, 1900

##### TOMODACTYLUS NITIDUS (Peters)

*Liuperus* [sic] *nitidus* PETERS, Monatsb. Akad. Wiss. Berlin, 1869, p. 878 (state of Puebla).

*Tomodactylus nitidus* KELLOGG, U. S. Nat. Mus. Bull. 160, 1932, pp. 120-123.

Six specimens were secured, one from the mountainside west of Acultzingo, Veracruz, April 30, 1939 (U.S.N.M. No. 114099), and five (U.S.N.M. Nos. 114094-114098) from a locality 8 km. west of Cuernavaca, Morelos, August 6, 1939. They were found under stones.

##### TOMODACTYLUS ANGUSTIDIGITORUM Taylor

*Tomodactylus angustidigitorum* TAYLOR, Univ. Kansas Sci. Bull., vol. 26, 1940g, pp. 494-496, pl. 55, fig. 1 (Quiroga, Michoacán).

A small specimen (U.S.N.M. No. 114100) is from a locality 6 km. east of Carapa, Michoacán, August 12, 1939. It was found under a rotten log.

##### TOMODACTYLUS AMULAE Günther

*Tomodactylus amulae* GÜNTHER, Biologia Centrali-Americana, Rept. Batr., Apr. 1900, p. 219, pl. 64, fig. c (Amula, state of Guerrero).

A single specimen (U.S.N.M. No. 114101), obtained by Taylor under the bark of a rotting log at Omilteme, Guerrero, August 2-4, 1940, is referred to this species.

## Family HYLIDAE Günther, 1858

Genus *HYLA* Laurenti, 1768

We realize that in the great heterogeneous assemblage of nearly 300 species which is the genus *Hyla* (*sensu lato*), several generic groups are usually included. Certain of these groups long associated with *Hyla* can be placed in their proper genera with little difficulty; among these may be mentioned *Boana* Gray, *Plectrohyla* Brocchi, *Acrodytes* Fitzinger, and perhaps *Trachycephalus* Tschudi. Representatives of *Plectrohyla* and *Acrodytes* occur in México and are recognized under their proper generic names.

**HYLA ROBERTMERTENSI** Taylor

*Hyla robertmertensi* TAYLOR, Proc. Biol. Soc. Washington, vol. 50, 1937b, pp. 43-45, pl. 2, figs. 3-7 (Tapachula, Chiapas).

Twenty-five specimens were secured at La Esperanza, April 5 to 28, 1940 (U.S.N.M. Nos. 114737-114753) and Cruz de Piedra, April 25 and May 15, 1940 (U.S.N.M. Nos. 114754-114761), Chiapas. They were found on vegetation in or beside small streams.

**HYLA SMITHII** Boulenger

*Hyla smithii* BOULENGER, Zool. Rec., vol. 38, 1902, Rept. Batr., p. 33 (Cuernavaca, Morelos).

In all, 331 specimens of this frog were secured. The following specimens have been placed in the Museum collection: MORELOS: 5 km. south of Cuernavaca, January 24, 1939 (U.S.N.M. No. 114788); Puente de Ixtla, January 26-27, 1939 (U.S.N.M. Nos. 114789-114813). GUERRERO: Agua del Obispo, February 4 and August 31, 1939 (U.S.N.M. Nos. 114814-114829); Tierra Colorada, February 12 and August 31, 1939 (U.S.N.M. Nos. 114830-114836). MICHOACÁN: 4 km. north of Apatzingán, March 14-18, 1939 (U.S.N.M. Nos. 114836-114861).

Near Apatzingán males were calling from vegetation in a stream under a large, old, constantly dripping, overhead aqueduct. In Morelos they were found in banana plants. At Agua del Obispo and Tierra Colorada they were found in the axils of *Calladium* leaves growing in or very near small streams.

**HYLA UNDERWOODI** Boulenger

*Hyla underwoodi* BOULENGER, Ann. Mag. Nat. Hist., ser. 7, vol. 3, 1899, p. 277 (Costa Rica).

Twenty-eight specimens were secured, from the vicinity of Palenque, Chiapas, July 6-9, 1939 (U.S.N.M. Nos. 114973-114978), and from Pozo de la Jicotea, near Piedras Negras, Guatemala, June 3-10, 1939 (U.S.N.M. Nos. 114951-114972).

## HYLA EBRACCATA Cope

## FIGURE 60, H

*Hyla ebraccata* COPE, Proc. Acad. Nat. Sci. Philadelphia, vol. 26, 1874, p. 69 (Nicaragua).

*Hyla leucophyllata* TAYLOR, Univ. Kansas Sci. Bull., vol. 28, pt. 1, No. 5, May 15, 1942c, p. 80.

A series of five specimens was collected at Piedras Negras, Petén, Guatemala, June 3–10, 1939 (U.S.N.M. Nos. 111148–111152). These were reported by Taylor (*loc. cit.*) as belonging to *Hyla leucophyllata*. We believe they are more correctly referable to *Hyla ebraccata* Cope, originally described merely as a "color variety" of *Hyla leucophyllata*, but apparently meriting a specific designation.

## HYLA RICKARDSI Taylor

*Hyla rickardsi* TAYLOR, Univ. Kansas Sci. Bull., vol. 25, No. 17, 1938 (July 10, 1939b), pp. 385–388, pl. 41, figs. 1–8 (Potrero Viejo, Veracruz).

Of 40 specimens, a series of topotypes, U.S.N.M. Nos. 108675, 114731–114736, is from Potrero Viejo, September 26, 1939, and U.S.N.M. Nos. 114711–114730 are from Palma Sola, Veracruz, January 8, 1939. The two series agree and are in every way typical.

## HYLA LOQUAX Gaige and Stuart

*Hyla loquax* GAIGE and STUART, Occ. Papers Mus. Zool. Univ. Michigan, No. 281, 1934, pp. 1–3 (Ixpuc Aguada, north of La Libertad, El Petén, Guatemala).

A series of 33 specimens is from the vicinity of Piedras Negras, Guatemala, June 3–10, 1939 (U.S.N.M. Nos. 114609–114641). Most of the specimens were found at the edge of a small lake, locally known as Pozo de la Jicotea. The bright reddish coloration of the post femoral region is typical.

## HYLA ROZELLAE Taylor

*Hyla rozellae* TAYLOR, Univ. Kansas Sci. Bull., vol. 28, pt. 1, No. 5, May 15, 1942c, pp. 78–79 (Salto de Agua, Chiapas).

The type and paratype series, U.S.N.M. Nos. 115039 (type), 115030–115038, 115040–115055, are the only known specimens. This form, a species perhaps related to *Hyla loquax* and *rickardsi*, has a reduced axillary web and the vocal sac is absent.

Specimens were taken at Finca Juárez, May 8–10, 1940 (U.S.N.M. Nos. 115052–115055), at Salto de Agua, 1,200 feet, April 18, 1940 (U.S.N.M. Nos. 115038–115051), and Las Nubes, 2,900 feet, April 18, 1940 (U.S.N.M. Nos. 115038–115051), on Mount Ovando near Escuintla, Chiapas. All were found sitting on vegetation at the edge of small, steeply inclined streams. None was heard calling and, in fact, only a single adult, the type, was found. All the other specimens are recently transformed or half grown.

## HYLA ARBORICOLA Taylor

*Hyla arboricola* TAYLOR, Univ. Kansas Sci. Bull., vol. 27, pt. 1, No. 7, 1941d (December), pp. 118-119, pl. 5, fig. 1 (6 miles east of Omilteme, Guerrero, 7,000 feet).

Four specimens, two paratypes (U.S.N.M. Nos. 114593-114594) and two additional topotypes (actually paratypes but not so mentioned in the type description), are numbered, U.S.N.M. Nos. 114392-114393. They were collected on August 2-6, 1940, by Taylor.

## HYLA EUPHORBIAECA Günther

*Hyla euphorbiacea* GÜNTHER, Catalogue of the Batrachia Salientia in the collection of the British Museum, 1858 (1859), p. 109, pl. 10, fig. C (Córdoba, Veracruz; Cordilleras [of] México).

Twelve specimens were secured in bromelias at the crest of the mountain ridge a few miles southwest of Acultzingo, Veracruz, March 17 and August 11, 1940 (U.S.N.M. Nos. 114552-114563). Notes taken in the field state: "In life most specimens are green above, but a few are brownish; the light areas on the concealed surfaces of the thighs are light yellowish orange and the groin is of the same tint."

This form is quite distinct from *Hyla eximia*, with which it has been confused in the literature.

## HYLA LAFRENTZI Mertens and Wolterstorff

*Hyla lafrentzi* MERTENS and WOLTERSTORFF, Zool. Anz., vol. 84, pts. 9, 10, 1929, pp. 235-241 (Desierto de los Leones, Distrito Federal).

Thirty-one specimens are from the following localities: HIDALGO: El Chico National Park, September 17, 1939 (U.S.N.M. Nos. 114606-114608). MÉXICO: Llano Grande, 8 km. west of Río Frío, August 2, 1939 (U.S.N.M. Nos. 114581-114605). MORELOS: Zempoala, February 21, 1939 (U.S.N.M. Nos. 114578-114580).

These specimens are in every way typical.

## HYLA PACHYDERMA Taylor

## PLATE 25

*Hyla pachyderma* TAYLOR, Univ. Kansas Sci. Bull., vol. 28, pt. 2, No. 4, Nov. 14, 1942d, pp. 308-310 (Pan de Olla [south of Teziutlán, Puebla], Veracruz).

The type and paratype series, the only specimens known, are U.S.N.M. Nos. 115029 and 115026-115028, collected on March 22, 1940.

These specimens came from approximately 4,000 feet elevation. They were found sitting on bushes and weeds beside a small, bounding stream near Pan de Olla, Veracruz. The actual locality is but a few kilometers from Teziutlán, Puebla. None of this species was heard calling, although *H. arborescendens* was calling on all sides.



**HYLA ROBERTSORUM** Taylor

*Hyla robertsororum* TAYLOR, Univ. Kansas Sci. Bull., vol. 26, 1939 (Nov. 27, 1940e), pp. 393-396, figs. 5-6 (El Chico National Park, Hidalgo).

A fine series of 59 topotypic specimens was secured by the two of us on September 17, 1939 (U.S.N.M. Nos. 114762-114786). These, like the original type series, were found on plants at the edge of a stream. There were many young specimens, some bright green in life. Frequently the young were found basking in the sun on leaves overhanging the stream.

**HYLA BISTINCTA** Cope

*Hyla bistincta* COPE, Proc. Amer. Philos. Soc., vol. 17, 1877, p. 87 (probably Veracruz).

Fifteen specimens were secured at the following localities: MÉXICO: 20 km. west of Villa Victoria, March 6, 1939, U.S.N.M. No. 114513. MICHOACÁN: Uruapan, March 11-12, 1939, U.S.N.M. Nos. 114514-114524. VERACRUZ: Mountain southwest of Acultzingo, March 17, 1940, U.S.N.M. No. 114525. The first specimen listed (a juvenile) was found under a stone in a grassy flood plain of a small stream. At Uruapan they were found in banana plants, protected by the thick outer sheaths of the trunk. Above Acultzingo, Veracruz, a single specimen was found in a bromelia. The latter is much more distinctly marked than the others. In life the colors were described as follows (Smith, field notes): "General dorsal ground color a rich, creamy-slate; marking on side of head dark purplish brown; light areas on sides of abdomen creamy white, except a pale green tint in axilla and groin; latter color dimly visible along lower portion of sides of body; anterior surfaces of entire hind leg somewhat greenish, less so on anterior surface of arms; light areas of concealed surfaces of thigh, greenish."

The tarsal fold is more distinct in the eastern specimens than in the western; and the elongated anal flap, although having the median vertical groove, is somewhat less crenelated on the posterior border.

**HYLA PHAEOTA** Cope

## PLATE 26

*Hyla phaeota* COPE, Proc. Acad. Nat. Sci. Philadelphia, vol. 6, 1862, pp. 358-359 (Turbo, Colombia).—TAYLOR, Univ. Kansas Sci. Bull., vol. 28, pt. 1, No. 5, May 15, 1942c, pp. 80-81, pl. 8, figs. 1, 1a, 1b, 1c.

A series of 11 specimens of this species was collected at Piedras Negras, Petén, Guatemala, May 28-29, 1939. The cataloged specimens are U.S.N.M. Nos. 111139-111147. These were reported by Taylor (*loc. cit.*).

Specimens were captured at night on the ground at the edge of small, temporary pools. As the locality is very close to the Mexican border this species must be reckoned as a member of the fauna of México.

## HYLA BAUDINII Duméril and Bibron

*Hyla baudinii* DUMÉRIL and BIBRON, *Erpétologie générale*, vol. 8, 1841, pp. 564-565 (México).

In all, 133 specimens were secured at the following localities: CHIAPAS: U.S.N.M. Nos. 114487-114494, Cruz de Piedra, April 25 and May 10, 1940; U.S.N.M. Nos. 114498-114504, vicinity of La Esperanza, June 3-5, 1940; U.S.N.M. Nos. 114495-114497, Colonia Soconusco, May 9 and 23, 1940; U.S.N.M. Nos. 114473-114486, Palenque, July 6-22, 1939. GUERRERO: U.S.N.M. No. 114508, El Treinte, September 4, 1939. OAXACA: U.S.N.M. No. 114512, Coyul, May, 1940. PUEBLA: U.S.N.M. No. 114509, San Diego, near Tehuacán, August 21, 1939. SAN LUIS POTOSÍ: U.S.N.M. No. 114468, Tamazunchale, May 1, 1939. TABASCO: U.S.N.M. Nos. 114505-114507, Tenosique, June 25-30, 1939. TAMAULIPAS: U.S.N.M. No. 106244, Hacienda La Clementina, November 22, 1938. VERACRUZ: U.S.N.M. Nos. 114433-114457, Cuautlapan, December 20, 1939, January to February, July and August 7-14, 1940; U.S.N.M. Nos. 114458-114467, Potrero Viejo, December 15, 1938 to January 16, 1939. GUATEMALA: U.S.N.M. Nos. 114469-114472, near Piedras Negras, Petén, May 29 to June 10, 1939.

## HYLA ARENICOLOR Cope

*Hyla arenicolor* COPE, *Journ. Acad. Nat. Sci. Philadelphia*, ser. 2, vol. 6, 1866a, p. 84 (northern Sonora).

Two specimens were obtained, one near Cuernavaca, Morelos, September 6, 1939 (U.S.N.M. No. 114432), the other 11 km. east of Chilpancingo, Guerrero, August 29, 1939 (U.S.N.M. 114431).

Southern specimens of this species are somewhat heavier and the dark spotting on the body is less distinct than in more typical northern specimens.

## HYLA STAUFFERI Cope

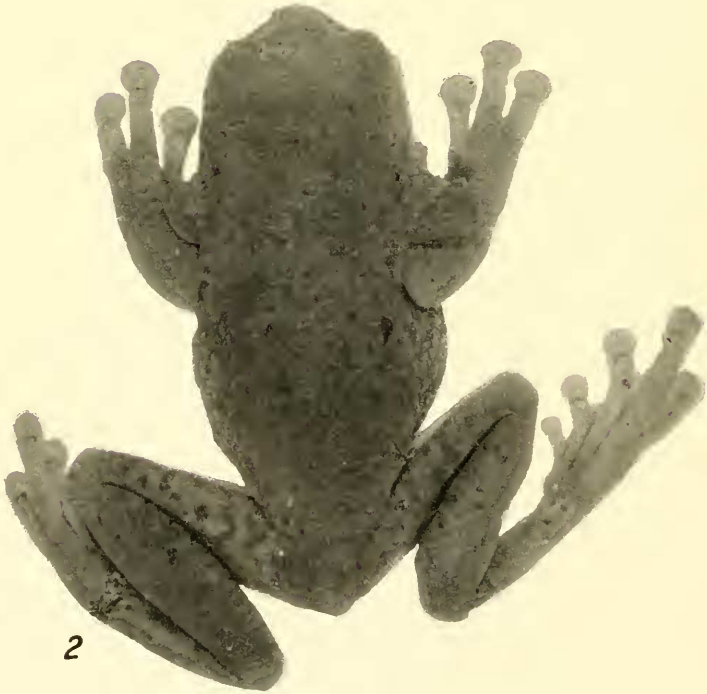
*Hyla staufferi* COPE, *Proc. Acad. Nat. Sci. Philadelphia*, vol. 17, 1865a, p. 195 (Orizaba, Veracruz).

In all, 103 specimens were secured at the following localities: CHIAPAS: Palenque, July 7-16, 1939, U.S.N.M. Nos. 114902-114925; Cruz de Piedra, near Acacoyagua, April 25, 1940, U.S.N.M. Nos. 114925-114931. OAXACA: Tehuantepec, January 1-4, 1940, U.S.N.M. Nos. 114932-114949. TABASCO: Tenosique, June 30, 1939, U.S.N.M. No. 114950. VERACRUZ: Cuautlapan, January 1, 1939, U.S.N.M. No. 114862; Palma Sola, January 8, 1939, U.S.N.M. No. 114863; Presidio, January 10, 1939, U.S.N.M. Nos. 114864-114865; Potrero Viejo, December 15, 1938, to January 9, 1939, and September 16, 1939, U.S.N.M. Nos. 114866-114886; 16 km. east of San Juan de la Punta, December 28, 1938, U.S.N.M. Nos. 114887-114901.

At Tehuantepec and Cuautlapan specimens were found in banana plants, protected by the outer sheaths. At Palma Sola, San Juan de la Punta, and Palenque they were found commonly in bromelias.



*Hyla phaeota* Cope: 1, U.S.N.M. No. 111145, from Piedras Negras, Guatemala, snout-to-vent length 54 mm.; 2, U.S.N.M. No. 111143, same locality, length 56 mm.



- 1, *Acrodytes spilomma* (Cope): U.S.N.M. No. 114979, from Río Coy, near Pujal, San Luis Potosí, snout-to-vent length about 65 mm.  
2, *Acrodytes modesta*, new species: U.S.N.M. No. 115013, type, from Cruz de Piedra, near Acacoyagua, Chiapas, snout-to-vent length 70 mm.

## HYLA EXIMIA Baird

*Hyla eximia* BAIRD, Proc. Acad. Nat. Sci. Philadelphia, vol. 7, 1854, p. 61 (México-Distrito Federal).

Eight specimens were secured as follows: DISTRITO FEDERAL: Atzacualco, October 6, 1939 (U.S.N.M. No. 114568). MICHOACÁN: Sahuayo, September 14, 1939 (U.S.N.M. Nos. 114569–114571). MÉXICO: 20 km. west of Villa Victoria, March 6, 1939 (U.S.N.M. Nos. 114564–114567).

Kellogg (1932, p. 167) inadvertently included U.S.N.M. Nos. 32396–32398 in his list of *H. eximia*. These are actually *H. staufferi* and are properly so listed on page 174. The specimen listed as B. M. 1901.12 from Cuernavaca, Morelos, is *Hyla smithii* Boulenger.

## HYLA MIOTYMPANUM Cope

*Hyla miotympanum* COPE, Proc. Acad. Nat. Sci. Philadelphia, vol. 15, 1863, p. 47 (near Jalapa and Mirador, Veracruz).

In all, 302 specimens were secured at the following localities: VERACRUZ: 2 km. west of Acultzingo, December 19, 1939 (U.S.N.M. Nos. 114692–114706); 8 km. east of Acultzingo, January 18, 1939 (U.S.N.M. Nos. 114677–114691); Cuautlapan, January of 1939 and 1940, and August 7–14, 1940 (U.S.N.M. Nos. 114647–114661); 5 km. west of Fortín, December 14–15, 1938 (U.S.N.M. Nos. 114662–114676). PUEBLA: San Diego, August 25, 1939 (U.S.N.M. Nos. 114707–114710).

The specimens from west of Acultzingo were found in a protected, shady pocket at the head of a very small arroyo, on a steep mountainside, December 19, 1939. They were calling during the day and were not at all wary. Most were caught merely by reaching out and grasping them, without the necessity of grabbing. They jumped only when practically stepped upon. Some were in water, and others were on bushes. A clasping pair was taken, and the eggs and larvae, presumably of the same species, were seen in the water.

On January 18, 1939, calling males were collected on vegetation by the side of a river east of Acultzingo.

On December 15, 1938, many calling males were collected at Fortín in or near a roadside gutter which is constantly supplied with water by seeping springs. At this locality calling males can be heard at practically any time of the year.

## HYLA MELANOMMA Taylor

*Hyla melanomma* TAYLOR, Univ. Kansas Sci. Bull., vol. 26, No. 15, 1939 (Nov. 27, 1940g), pp. 508–510, pl. 57 (7 miles east of Chilpancingo, Guerrero).

On August 29, 1939, we secured five specimens, U.S.N.M. Nos. 114642–114646, within a few hundred feet of the place where the type was captured.

**HYLA HAZELAE** Taylor

*Hyla hazelae* TAYLOR, Univ. Kansas Sci. Bull., vol. 26, 1939 (Nov. 27, 1940e), pp. 385-389, figs. 1-2 (Cerro San Felipe, 10 miles north of Oaxaca, Oaxaca).

Two topotypes, U.S.N.M. Nos. 114576-114577, collected only a few hundred feet from the exact type locality on Cerro San Felipe, Oaxaca, July 10-20, 1940, are in the collection.

**HYLA DENDROSCARTA** Taylor

*Hyla dendroscarta* TAYLOR, Proc. U. S. Nat. Mus., vol. 89, 1940c, pp. 45-47, pls. 2-3 (Cuautlapan, Veracruz).

A total of 159 specimens was secured at Cuautlapan, Veracruz, the type locality, January 16, 1939, January to February and August 7-14, 1940. The following specimens have been numbered in the collection: U.S.N.M. No. 108679, type; U.S.N.M. Nos. 108676, 108680-108686, paratopotypes; U.S.N.M. Nos. 114526-114550, topotypes.

**HYLA FORBESI** Taylor

*Hyla forbesi* TAYLOR, Univ. Kansas Sci. Bull., vol. 26, 1939 (1940g), pp. 513-515, pl. 58 (mountain slope 3 miles southwest of Acultzingo, Veracruz).

Four topotypes were obtained August 11, 1940 (U.S.N.M. Nos. 114572-114575). They were secured by a local mountaineer. The normal habitat of the species remains unknown. We presume it to be a bromelicolous form.

**HYLA ARBORESCANDENS** Taylor

*Hyla arborescandens* TAYLOR, Univ. Kansas Sci. Bull., vol. 25, 1939b, pp. 388-391, fig. 1 (mountainside about 3 km. southwest of Acultzingo, Veracruz).

Seventy-four specimens were secured at the following localities: OAXACA: Cerro San Felipe, July 10-20, 1940 (U.S.N.M. No. 114403). PUEBLA: Pájaro Verde, August 20, 1939 (U.S.N.M. Nos. 114396-114402). TLAXCALA: Apizaco, August 22, 1939 (U.S.N.M. No. 108671). VERACRUZ: Above Acultzingo, August 11, 1940 (U.S.N.M. Nos. 114404-114405, 108672-108674); Pan de Olla, March 22, 1940 (U.S.N.M. Nos. 114406-114430).

The specimens from Pájaro Verde and the mountain slopes southwest of Acultzingo were found only in bromelias, where they could frequently be heard calling during the day as well as at night. Near Pan de Olla, however, large numbers were found sitting on the ground, on rocks, and on low bushes beside a small, boisterous stream in a rugged mountain ravine.

**HYLA SMARAGDINA** Taylor

*Hyla smaragdina* TAYLOR, Copeia, 1940b, No. 1, March 30, pp. 18-20, fig. 1 (mountain 6 km. east of Cojumatlán, Michoacán).

A single topotype was secured on September 14, 1939 (U.S.N.M. No. 114787). This was a year to a day after the type series was col-

lected. At that time they were plentiful in the bromelias. On the occasion of this visit only the single specimen was found in a day's collecting.

**HYLA species**

A specimen of *Hyla* taken on the mountain above Acultzingo on August 11, 1940, was cataloged in the Museum collection (U.S.N.M. No. 115056), but this has since been misplaced and cannot be found at the present time.

The field notes of Smith on this specimen read: "Green form, probably new, about the size of *Hyla arborescendens* Taylor but with the fingers half webbed."

**Genus ACRODYTES Fitzinger, 1843**

The tree frogs having the vocal sacs set back behind the angle of the jaw seem to form a natural hylid group. Moreover, as pointed out by Cope, there is a parotoid gland covering much of the dorsal surface of head and shoulders. The skin secretions, which have a quality irritating to mucous membranes, are apparently different from those produced by other species of tree frogs. This combination of characters appears to set this group completely off from *Hyla*.

In 1862 Cope (1862, p. 354) proposed the genus *Scytopsis* for *Scytopsis hebes*, which is (*vide* Boulenger, 1882, p. 365) a synonym of *Rana venulosa* Laurenti=*Hyla venulosa* Daudin. Since *Acrodytes* was proposed in 1843 (Fitzinger, 1843, p. 30), having as genotype *Hyla venulosa* Daudin=*Rana venulosa* Laurenti (1768, p. 31 "Indiis"), this name must take precedence over Cope's *Scytopsis* for this group.

**ACRODYTES SPILOMMA (Cope)**

PLATE 27, FIGURE 1

*Hyla spilomma* COPE, Proc. Amer. Philos. Soc., vol. 17, 1877, p. 86 (Cosamalopan, Veracruz).

A series of 31 specimens was acquired from the following localities in México: SAN LUIS POTOSÍ: U.S.N.M. No. 114979, Río Coy, near Pujal, December 8, 1938. VERACRUZ: U.S.N.M. Nos. 114980-114990, Potrero Viejo, December 21-29, 1938; U.S.N.M. No. 114991, 10 miles east of San Juan de la Punta, December 28, 1938; U.S.N.M. Nos. 114992-115000, 115004-115008, Cuautlapan, January 4-16, 1939, and August 7-14, 1940; U.S.N.M. Nos. 115001-115003, Tezonapa, January 11, 1939. CHIAPAS: U.S.N.M. No. 115020, Cruz de Piedra, near Acacoyagua, April 25, 1940.

This series shows very little structural variation, and the color and pattern variation is likewise small. The dorsal pattern consists of a black or brownish-black stripe on each side, in the dorsolateral region sometimes broad enough to cover the back, and widening pos-

teriorly; these are bordered laterally by two lighter brown or reddish-brown stripes, which continue back two-thirds the length of the side and are occasionally connected by a light irregular stripe across the rump. The limbs are barred, the bars sometimes merely stippled lines or stripes. A well-defined, elongate, irregular, black spot from eye above tympanum to behind axilla. It is variable in color on the venter and under limbs, sometimes clouded, rarely nearly cream white, but oftener speckled or stippled black on a light or clouded surface.

The maximum size in mm., as shown by this representative series, is 77 in females, while 10 measured from 70-74. The maximum in males is 71, while three others measured from 65 to 70. It is known to reach a length of 83 mm.

The distribution from San Luis Potosí to southern Chiapas gives this form a rather large known range. In Chiapas it is largely replaced by another species of the genus which is here described. A third, much larger form, being described elsewhere, occurs in Guerrero.

During the dry season specimens were frequently encountered in bromelias and on banana plants; at Pujal the single specimen was ensconced in a rotten log.

The specimens from Veracruz when captured secreted copiously a white viscous substance, which dried quickly and adhered to any object touching it. In contact with the mucous membranes of the nose the secretion caused violent sneezing, and other symptoms of a severe cold, lasting two to three hours. Occasionally such symptoms appeared before there was any possible chance of direct transference of the secretion to the nostril. The secretions that adhered to collecting sacks produced an effect as long as two or three days later as the sacks were used for other specimens.

ACRODYTES MODESTA, new species

PLATE 27, FIGURE 2; PLATE 28, FIGURES 2, 3

*Type*.—U.S.N.M. No. 115013, collected at Cruz de Piedra, near Acacoyagua, Chiapas, México, April 21, 1940, by Dr. and Mrs. Hobart M. Smith.

*Paratypes*.—U.S.N.M. Nos. 115010-115012, La Esperanza, Chiapas, April 7 to June 3, 1940; U.S.N.M. Nos. 115014-115019, 115021-115023, Cruz de Piedra, Chiapas, April 21 and May 10, 1940; U.S.N.M. Nos. 115024-115025, Colonia Soconusco, Chiapas, May 4-9, 1940.

*Diagnosis*.—A small member of the genus, the known maximum size (15 specimens) 70 mm. Related to *nigropunctata* but lacking distinctive markings, having larger terminal pads on tips of digits, narrower head, the eye larger, its diameter greater than its distance from the nostril, and with a widened, bifid, subarticular tubercle



on the fourth finger. The skin is not so strongly thickened by the "parotoid" gland as in *nigropunctata*.

*Description of type.*—Adult male. Head rather flattened, the eyes elevated; canthus rostralis rounded, the lores somewhat concave; eye large, the diameter (8 mm.), greater than the distance from eye to nostril (5.5 mm.); length of snout, 7 mm.; interorbital distance (8 mm.) greater than the width of an eyelid (6.9 mm.); snout extending about 2 mm. beyond lower lip; tympanum strongly overhung by a thick fold, concealing its upper edge; diameter of tympanum, about 4.2 mm., a little more than half the diameter of eye; a pair of black, elongate, vocal sacs, permanently extruded, behind angles of jaws. Tongue broader than long, somewhat cordiform, notched behind, very slightly free behind; vomerine teeth in two transverse, raised groups narrowly separated medially, the tips of the teeth transversely grooved, appearing bifid in profile; openings of the mucous glands of palate in a transverse sinuous groove; choanae moderate in size.

Fingers rather short, the diameters of the terminal pads of outer toes 5 mm., somewhat larger than the diameter of the tympanum; outer toes less than one-third webbed, with only a trace between first and second, but continued as a narrow fringe to the pads; palmar tubercles rather ill defined, the median somewhat bifid, the inner large, its dorsal portion covered with minute, brown, horny spinules or tubercles, subarticular tubercles moderate except distal one on outer finger, which is much larger than the others, nearly as wide as toe and more or less bifid; a few distinct supernumerary tubercles. Toes about three-fifths webbed; subarticular tubercles moderate; inner metatarsal tubercle of moderate size, rather flattened; outer smaller, distinct; supernumerary tubercles distinct; a thickened ridge of skin present suggesting a very weak tarsal fold. When limbs are folded, the heels overlap somewhat; tibiotarsal articulation reaches to middle of eye.

Skin above with numerous small, equal-sized pustules, scattered equally over the dorsal surface, more numerous on sides; venter, including chin and underside of arm and thigh, strongly areolate; anal flap short, fluted, followed behind by a groove.

*Color in alcohol.*—Above nearly uniform lavender-brown to purplish brown, the pustules darker on back and blackish on sides; a few small black spots on the dorsal surface of femur, tibia, and foot, but no trace of bars; belly dirty white with numerous small black flecks or spots; tympanum light brown.

*Measurements in mm.*—Snout to vent, 69; width of head, 25; length of head, 23; arm, 42; leg, 108; tibia, 34; foot, 45.

*Variation.*—Many of the specimens are of a lighter, lavender-brown color, while a few are darker, more purplish brown. None,

however, shows any trace of a black dorsal pattern. Many show no trace of the black flecks or spots on the top of femur and tibia; one very light, fawn-colored specimen from the Gulf drainage of Tabasco (Tenosique, U.S.N.M. No. 115009) is tentatively referred to this species.

*Remarks.*—During the wet season in Chiapas specimens were found calling at night in a tree about 12 feet above the ground. The call is a loud, raucous, grinding noise that lasts for perhaps a second. It is sometimes repeated twice or thrice, and then follows a long period of silence.

The skin secretion was very meager, perhaps owing to the season. No irritating effect on the skin or nasal membranes was noticed; however, none of it was placed directly on the membranes.

#### Genus PLECTROHYLA Brocchi, 1877

The fortunate revival of the generic name *Plectrohyla* demands the allocation of another generic name which like *Plectrohyla* is based upon a species with a more or less conspicuous pollex. This is the genus *Boana* Gray (1825, p. 214), which proves even more strongly differentiated from *Hyla* (*sensu lato*) than *Plectrohyla*, and certainly is not congeneric with the latter, despite superficial similarities. *Plectrohyla* differs from the older *Boana* in the character of the vomerine teeth (which approach those of *Hyla*); the pollex bones do not pierce the flesh, and there are perhaps other less obvious characters.

The genus *Boana*<sup>5</sup> may be defined as a group having a pollex rudiment more or less developed, a single subgular vocal sac; and vomerine teeth which form curved or angular series (rarely diagonal) tending to converge anteriorly. Perhaps some 20 species, all South American, are referable to the genus. To the Central American and Mexican genus *Plectrohyla* belong six forms described at present:

<i>Plectrohyla miliaria</i> (Cope)	<i>Plectrohyla guatemalensis</i> Brocchi
<i>Plectrohyla izil</i> Stuart	<i>Plectrohyla matudai</i> Hartweg
<i>Plectrohyla quecchi</i> Stuart	<i>Plectrohyla sagorum</i> Hartweg

#### PLECTROHYLA MATUDAI Hartweg

##### FIGURE 60, D; PLATE 29

*Plectrohyla matudai* HARTWEG, Occ. Papers Mus. Zool. Univ. Michigan, No. 437, June 30, 1941, pp. 5–9, pl. 1 (Mount Ovando, District of Soconusco, Chiapas).—TAYLOR, Univ. Kansas Sci. Bull., vol. 28, pt. 1, No. 3, May 15, 1942a, pp. 39–40.

A series of 28 topotypes (U.S.N.M. Nos. 111094–111121), including both adults and larvae, was collected April 15–16, 1940, on Mount

<sup>5</sup> Genotype [*Rana*] *boans* Linnaeus (1758, p. 213) from "America" (= *Hyla boans* Daudin, 1803, p. 21, pl. 11, from "Surinam"). The name *Hypsiboas* Wagler (1830, p. 200) (genotype, *Hyla palmata*) was chosen by Cope for this genus. Apparently he was unaware of Gray's name.

Ovando at an elevation of 2,800 to 6,000 feet. The tadpoles were taken in small streams and the adults were found in the same general region. The tadpoles may be distinguished by having a serrated edge on the upper beak, the posterior serrations being fanglike.

The adults may be distinguished by the very blunt snout; the nostrils at the extreme anterior end of snout; the areas surrounding them somewhat elevated; tarsal fold forming a long, free, flexible flap; toes webbed to the terminal disks, except on fourth toe, which has distal joint free (but with a fringe); tympanum almost hidden by thick pustulate skin; males *with* a vocal sac (not *without* as stated in the type description). The maximum known size of the female is 45 mm.

Most of the 36 specimens are young. One young specimen was obtained at Finca Juárez; several young and one adult are from Las Nubes, 2,900 feet, on Mount Ovando, Chiapas. Seven adults were collected on Mount Ovando at 6,000 feet.

All were taken in small streams, sitting on vegetation, on boulders, or, in one case, in the water. The single adult from Las Nubes is a male, which was calling from the water. Other males, as well as females, were collected at 6,000 feet, but here no young were seen. Young were very numerous at Las Nubes, where they were observed sitting on the leaves of low plants at the edge of the water. A single young specimen from Finca Juárez was found under similar conditions.

The voice of the male of this species is much different from that of *P. sagorum*, being a single, sharp note that sounds very much like two pebbles struck together under water. The note is repeated at intervals of about two minutes.

It appears that this species lays the eggs near streams. Certainly the young pass through their larval stages in the streams. Some transforming young were obtained and one tadpole of the species is at hand.

**PLECTROHYLA SAGORUM** Hartweg

FIGURE 60, *E*; PLATE 30

*Plectrohyla sagorum* HARTWEG, Occ. Papers Mus. Zool. Univ. Michigan, No. 437, June 30, 1941, pp. 2-5, pl. 1, figs. 1-3 (Mount Ovando, District of Soconusco, Chiapas, Mexico).—HARTWEG and ORTON, Occ. Papers Mus. Zool. Univ. Michigan, No. 438, July 1, 1941, pp. 5-6.

This series of 18 topotypic specimens, U.S.N.M. Nos. 111122-111138, was obtained April 15-16, 1940, on Mount Ovando at an elevation of 5,000 to about 7,000 feet. The specimens, adult and young transformed, were collected exclusively from bromelias, which grow in profusion at this elevation on the mountain. The eggs, however, are probably laid in water on the ground, as tadpoles presumably of this species, were obtained by Hartweg (*loc. cit.*).

This species, closely related to *Plectrohyla matudai*, may be distinguished by the sharp point on the snout, the canthus rostralis distinct; skin moderately rough in males; the web on toes nowhere reaching pads, but leaving two joints on fourth toe and the terminal parts of other toes free, except for a narrow fringe; vocal sac in male; tympanum more or less visible; maximum size known, 45 mm. (female).

Males were heard calling in the daytime from bromelias, and the call was positively traced to this species on one occasion. The call is a slightly drawn out, coarsely trilled, nasal *quuaack*.

The spurs on the pollex differ in the two Chiapas forms of the genus. Figure 60, *D-F*, illustrates spurs of both species, and that of *P. guatemalensis*.

#### Genus HYLELLA Reinhardt and Lütken, 1861

##### HYLELLA PICTA Günther

*Hylella picta* GÜNTHER, *Biologia Centrali-Americana*, Rept. Batr., 1901, pp. 286-287, pl. 73, fig. C (Jalapa, Veracruz).

Forty-four specimens are from Potrero Viejo, December 21-26, 1938, June 13 and 26, and August 12, 1939 (U.S.N.M. Nos. 114102-114126), and Cuautlapan, January 16, January, February, and August 7-14, 1940 (U.S.N.M. Nos. 114127-114132), Veracruz, where the species is common about permanent ponds.

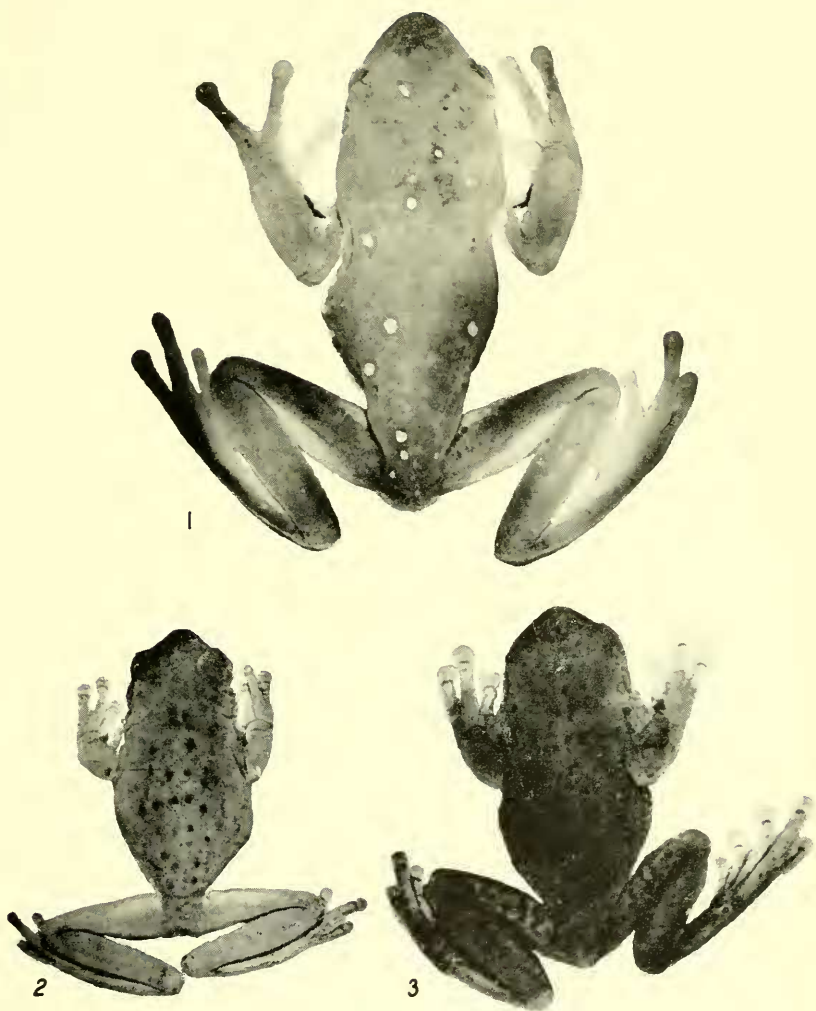
##### HYLELLA SUMICHRASTI (Brocchi)

*Ezerodonta sumichrasti* BROCCHI, *Bull. Soc. Philom. Paris*, ser. 7, vol. 3, No. 1, 1879, p. 20 (Santa Efigenia, Oaxaca).

*Hylella sumichrasti* BOULENGER, *Catalogue of the Batrachia Salientia s. Ecaudata in the collection of the British Museum*, 1882, pp. 420-421.

A series of 77 specimens was obtained at several localities within a radius of 50 miles of Tehuantepec, Oaxaca. The localities are Cerro Arenal, January 2, 1940 (U.S.N.M. Nos. 114133-114137); Tres Cruces, January 4, 1940 (U.S.N.M. Nos. 114138-114148); Lachiguiri, 7,100 feet, January 20, 1940 (U.S.N.M. No. 114149); Portillo Los Nanches, near El Limón, 7 leagues northwest of Tehuantepec, March 1940 (U.S.N.M. Nos. 114150-114155); "Tehuantepec," March 1940 (U.S.N.M. Nos. 114156-114163); La Concepción, May 1940 (U.S.N.M. Nos. 114164-114206); Río Grande, 12½ miles north of Niltepec, Oaxaca, January 26-30, 1940 (U.S.N.M. Nos. 114207-114209). All were found in bromelias in the hills and mountains surrounding the Tehuantepec plains; none was found on the plain itself, although bromelias occasionally are present.

The vocal sac is absent. Occasional specimens may show a slight elevation on the prevomers and teeth may occasionally occur on them.



1, *Agalychnis dacnicolor* (Cope): U.S.N.M. No. 116040, from Tierra Colorada, Guerrero.  
2, 3, *Aerodytes modesta*, new species: 2, U.S.N.M. No. 115021, paratype, from Cruz de Piedra, Chiapas, snout-to-vent length 61 mm.; 3, U.S.N.M. No. 115013, type, same locality, length 70 mm.



*Plectrohyla matudai* Hartweg: 1, E.H.T.-H.M.S. No. 26628, male topotype from Cerro Ovando, Chiapas, snout-to-vent length 38 mm.; 2, U.S.N.M. No. 111120, same locality, length 39 mm.



*Plectrohyla sagorum* Hartweg: 1, U.S.N.M. No. 111138, topotype from Cerro Ovando, Chiapas, snout-to-vent length 41.8 mm.; 2, U.S.N.M. No. 111127, same locality, length 45 mm.



*Agalychnis moreletii* (Duméril): 1, U.S.N.M. No. 116043, male, from Cuautlapan, Veracruz;  
2, U.S.N.M. No. 116044, same locality. Both about natural size.



Genus *DIAGLENA* Cope, 1887*DIAGLENA RETICULATA* Taylor

*Diaglena reticulata* TAYLOR, Univ. Kansas Sci. Bull., vol. 28, pt. 1, No. 4, May 15, 1942b, pp. 60-61, pl. 4, figs. 1, 1a, 1b, 1c, pl. 5, fig. 1 (Cerro Arenal, Oaxaca).

The type, U.S.N.M. No. 115500, was discovered on January 2, 1938, by Thomas MacDougall at Cerro Arenal, 30 km. northwest of Tehuantepec, Oaxaca.

Both forms of this genus appear to be terrestrial. The type of *reticulata* was captured in a terrestrial bromelia, while *Diaglena spatulata* has usually been found on the ground.

Genus *AGALYCHNIS* Cope, 1864*AGALYCHNIS CALLIDRYAS* (Cope)

*Hyla callidryas* COPE, Proc. Acad. Nat. Sci. Philadelphia, vol. 14, 1862, p. 359 (Panamá).

*Agalychnis callidryas* COPE, Nat. Hist. Rev., 1865b, p. 110.

A single specimen, U.S.N.M. No. 116042, taken at Santo Tomás, Tabasco, June 24, 1939, is referred to this species. The presumed distinctions between this species and *Agalychnis helenae* Cope are not great. This latter species has a purplish lateral stripe that is crossed by five diagonal cream lines, which touch a longitudinal cream line bordering the purple stripe above. *A. callidryas* lacks the longitudinal cream line but does have the diagonal lines. There is a green stripe of varying width on the dorsal surface of the femur in *callidryas* and it is also present in the type of *helenae*. Whether these forms are actually specifically distinct may be questioned. This specimen was taken from a bunch of orchids high in a large tree.

*AGALYCHNIS DACNICOLOR* (Cope)

## PLATE 28, FIGURE 1

*Phyllomedusa dacnicolor* COPE, Proc. Acad. Nat. Sci. Philadelphia, vol. 16, Aug. 1864, p. 181 (near Colima, Colima, México).

*Agalychnis dacnicolor* COPE, Journ. Acad. Nat. Sci. Philadelphia, ser. 2, vol. 6, 1866a, p. 86.

A typical specimen, U.S.N.M. No. 116040, was taken on August 31, 1939, at night, at Tierra Colorada, Guerrero, by following its call. U.S.N.M. No. 116041 is from Tehuantepec, Oaxaca, taken in March 1940, and is the first record for that state. The latter specimen has the tips of the digits narrowed, as in all other juveniles.

*AGALYCHNIS MORELETHI* (Duméril)

## PLATE 31

*Hyla moreletii* DUMÉRIL, Ann. Sci. Nat., Paris, ser. 3, Zool., vol. 19, 1853, p. 169 (Cobán, Verapaz, Guatemala).

*Agalychnis moreletii* COPE, Nat. Hist. Rev., 1865b, p. 110.

A total of 71 specimens was taken. Two series are numbered in the collection: U.S.N.M. Nos. 116043-116053 from Cuautlapan, Veracruz, January, 1939 and 1940, and August 7-14, 1940, and U.S.N.M. Nos. 116054-116069 from Finca Juárez, Chiapas, May 8-10, 1940. There are no constant differences between the two series. The southern specimens occasionally have the green stripe continued along the entire dorsal surface of the femur. In the northern specimens it is usually terminated some distance from the pelvis (body).

The transparent area of the lower eyelid has a network of silver rather than the vertical lines of *daenicolor* and *callidryas*. In males a vocal sac is present and a horny nuptial area on the base of the first finger. One specimen has a strangely curved spine ("humped back"), not, apparently, due to external injury.

The 60 specimens from Finca Juárez were collected by Smith on a single night. They were congregated about a short, erratic rivulet some 250 feet long, which led across an old and gravelly river channel to the river itself. A portion of the rivulet passed between two large boulders, between which a narrow but very deep pool of water, covered with duckweed, had collected. Bushes and trees well concealed the rivulet.

Field notes on the capture read, "The frogs were discovered quite by accident. Although they were singing occasionally no attention was given the voices as we passed the rivulet on the nearby trail, for I firmly believed the voices to be of the common *Leptodaetylus melanonotus* and thought no further of them. Fortunately, I hesitated slightly at the point where the trail crossed the rivulet, and happened to observe a clasping pair of these big green hylids, clinging to the side of a boulder. Search subsequently revealed that specimens were scattered all over the bushes and trees, on rocks near the water and even in the water. Several clasping pairs were collected, and the voices of singing males were positively traced.

"Egg-laying was well under way and apparently nearly completed. Masses of eggs were hanging from bush stems, from leaves and on the sides of boulders, invariably over the water. Especially numerous were the masses on the boulders bordering the deep pool mentioned above and hanging from tree limbs which extended over this pool.

"The most interesting discovery of all was that unusual numbers of *Leptodeira a. polysticta* had also collected here to feast on the frog eggs. Ten specimens were collected, and nearly all were either gorged with eggs, had started feeding on them, or were observed edging out on limbs to reach egg masses. Several were caught with the telltale eggs still adhering to their lips. One snake was observed while it rather hastily crawled out on a limb, found an egg mass, and started eating it. This egg mass was about ten feet above the surface of the water and was the highest observed.

“While no doubt the local population of *Agalychnis* was depleted by collecting all the adults that could be found, at the same time probably many times that number of eggs was saved, for the snakes would certainly have eaten many hundreds of eggs before they fell into the water.”

**Genus CENTROLENELLA Noble, 1920**

**CENTROLENELLA FLEISCHMANNI (Boettger)**

*Hylella fleischmanni* BOETTGER, Ber. Senck. Nat. Ges., 1893, p. 251 (San José Costa Rica).

*Centrolenella fleishmanni* (sic) TAYLOR, Univ. Kansas Sci. Bull., vol. 28, pt. 1, No. 5, May 15, 1942c, p. 74.

A single specimen, U.S.N.M. No. 115499, is referred to this species. It was taken at night during the dry season (April 19, 1940) at Salto de Agua, Chiapas, sitting on the leaves of a plant near the edge of a small rocky stream. In life it was pale green above, translucent below. The bones, visible through the flesh, were white.

**Genus ANOTHECA Smith, 1939**

**ANOTHECA CORONATA (Stejneger)**

FIGURE 60, *B, C*

*Gastrotheca coronata* STEJNEGER, Proc. U. S. Nat. Mus., vol. 41, Aug. 14, 1911, pp. 287–288 (Palomo, Valle de Orosi, Cartago, Costa Rica).

*Anotheca coronata* SMITH, Proc. Biol. Soc. Washington, vol. 52, Dec. 15, 1939, pp. 190–191, pl. 1, figs. 1, 2, 3, pl. 2, fig. 6.

In all, 138 specimens were secured, of which U.S.N.M. Nos. 116398–116412 are cataloged. All are from Cuautlapan, Veraacruz, collected January 1–16, 1939, December 20, 1939, and August 7–14, 1940. This series has been discussed earlier (Smith, *loc. cit.*).

A row of high spines crosses the back edge of the skull, above the tympanum, and decreases somewhat in size on the borders of the orbit, while those along the canthus are very short. Each is surrounded by a fleshy glandular apophysis, which appears to be some specialized type of gland, perhaps for poison. A substance is exuded when the live specimens are placed in alcohol and forms a thick yellow cream mat about the bases of the apophyses. The spines are fixed projections from certain bones of the head, curved forward or inward, and are fanglike in character. Ordinarily, when the glands surrounding the spines are full, the spines are almost completely hidden. When they are discharged the sharp top part of the spines is exposed. The spines vary greatly in length, the largest being something over 4 mm. in length. These objects are developed in both sexes, but their size is distinctly smaller in the females (see fig. 60, *B, C*).

Specimens were obtained from under the petioles of the banana leaves. These outer sheaths loosen and form cavities which may be

entered from above. These places were also favorite hiding quarters of *Bolitoglossa rufescens* and *B. platydactyla*. Most of the series was secured during the dry season, but others were obtained during the rains (August). Included in the latter specimens are a number of females, none of which show evidence of a dorsal pouch.

### Family MICROHYLIDAE Parker, 1934

#### Genus MICROHYLA Tschudi, 1838

##### MICROHYLA OLIVACEA (Hallowell)

*Engystoma olivaceum* HALLOWELL, Proc. Acad. Nat. Sci. Philadelphia, vol. 8, 1856 (1857), p. 252 (type locality not definite, but presumed to be Kansas).  
*Microhyla olivacea* PARKER, A monograph of the frogs of the family Microhylidae, 1934, p. 201.

One specimen, U.S.N.M. No. 105161, was collected at Río Santa María, Chihuahua, August 13, 1938. This form has a range extending from Coahuila and Durango, México, to Nebraska. The specimens reported by Taylor (1940g) from Sinaloa have recently been described (Taylor, 1943b), as *Microhyla mazatlanensis*.

##### MICROHYLA USTA USTA (Cope)

#### PLATE 32, FIGURES 1-4

*Engystoma ustum* COPE, Proc. Acad. Nat. Sci. Philadelphia, vol. 18, May 1866b, p. 131 (Guadalajara, Jalisco).  
*Engystoma mexicanum* PETERS, Monatsb. Preuss. Akad. Wiss. Berlin, Dec. 1869, p. 881 (state of Puebla [probably Matamoros]).

Five specimens from the state of Veracruz are referred to this form as follows: Palma Sola, January 8, 1939, U.S.N.M. No. 116422; Potrero Viejo, February 28, June 13-18 and September 26, 1939, U.S.N.M. Nos. 116423-116426.

Whether there is more than one recognizable form north of the Tehuantepec region cannot be stated at this time. No adequate series of specimens from the type locality are available in any museum. The type itself is in a deteriorated condition. It is possible that specimens from the plateau (Guadalajara and Guanajuato) are not the same as those from the lowlands of Guerrero, and Veracruz. The western specimens are larger than those obtained elsewhere. A male from Colima measures 27 mm. from snout to vent, while three females measure 29, 29, and 30 mm. The Guerrero collections examined (E.H.T.-H.M.S. Coll.) have small males and large females. Some variation in the relative size of the two tubercles of the metatarsus is evident but the inner is always equal or very nearly equal to the length of the first toe.

The specimen from Palma Sola was found in a clump of dead bromelias on the ground.



1



2



3



4



5



6



7



8



9



10

- 1-4, *Microhyla usta usta* (Cope): 1, E.H.T.-H.M.S. No. 1123, from Xaltianguis, Guerrero, snout-to-vent length 31 mm.; 2, E.H.T.-H.M.S. No. 1151, Tierra Colorada, Guerrero, length 27 mm.; 3, E.H.T.-H.M.S. No. 6547, Cuautlapan, Veracruz, length 26 mm.; 4, E.H.T.-H.M.S. No. 1150, Tierra Colorada, Guerrero, length 28 mm.
- 5-10, *Microhyla usta gadovii* (Boulenger): 5, E.H.T.-H.M.S. No. 1180, from Tonalá, Chiapas, snout-to-vent length 21.5; 6, E.H.T.-H.M.S. No. 1176, same locality, length 22 mm.; 7, E.H.T.-H.M.S. No. 1183, same locality; 8, E.H.T.-H.M.S. No. 1182, same locality; 9, E.H.T.-H.M.S. No. 1169, from Tapachula, Chiapas; 10, E.H.T.-H.M.S. No. 1170, from Tonalá, Chiapas. Figs. 7-10 all 25 mm. from snout to vent.